DETERMINATION OF FRESH HARVEST AGE AND PHYSIOLOGICAL RIPENING OF SEVERAL RED LONG BEAN LINES

THESIS

By

NADIROH

BACHELOR PROGRAM OF AGROECOTECHNOLOGY
FACULTY OF ANIMAL AND AGRICULTURAL SCIENCES
UNIVERSITAS DIPONEGORO
SEMARANG
2025

DETERMINATION OF FRESH HARVEST AGE AND PHYSIOLOGICAL RIPENING OF SEVERAL RED LONG BEAN LINES

By

NADIROH
Student ID Number: 23020221120002

One of the requirements for obtaining a Bachelor of Agriculture degree in the Bachelor Program of Agroecotechnology, Faculty of Animal and Agricultural Sciences, Universitas Diponegoro

BACHELOR PROGRAM OF AGROECOTECHNOLOGY
FACULTY OF ANIMAL AND AGRICULTURAL SCIENCES
UNIVERSITAS DIPONEGORO
SEMARANG
2025

LEMBAR PERNYATAAN KEASLIAN SKRIPSI

Yang bertanda tangan di bawah ini:

Nama	:	Nadiroh
N I M	:	23020221120002
Program Studi	:	S-1 Agroekoteknologi

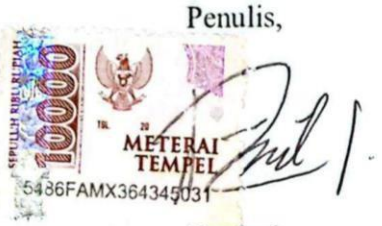
dengan ini menyatakan sebagai berikut:

1. Skripsi yang berjudul: **Penentuan Umur Panen Segar dan Masak Fisiologis Beberapa Galur Kacang Panjang Warna Merah** dan penelitian yang terkait dengan skripsi ini merupakan karya penulis sendiri.
2. Setiap ide atau kutipan dari karya orang lain berupa publikasi atau bentuk lainnya dalam skripsi ini, telah diakui sesuai dengan standar prosedur disiplin ilmu.
3. Penulis juga mengakui bahwa skripsi ini dapat dihasilkan berkat dukungan penuh dari Pembimbing yaitu: **Prof. Dr. Ir. Florentina Kusmiyati, M.Sc dan Bagus Herwibawa, S.P., M.P.**

Apabila di kemudian hari dalam skripsi ini ditemukan hal–hal yang menunjukkan telah dilakukannya kecurangan akademik, maka penulis bersedia gelar sarjana yang telah penulis dapatkan ditarik sesuai dengan ketentuan dari Program Studi S-1 Agroekoteknologi, Fakultas Peternakan dan Pertanian, Universitas Diponegoro.

Semarang, Juni 2025

Penulis,



Nadiroh

Mengetahui:

Pembimbing Utama	Pembimbing Anggota
Prof. Dr. Ir. Florentina Kusmiyati, M.Sc.	Bagus Herwibawa, S.P., M.P.

LEMBAR PENGESAHAN SKRIPSI

Judul Skripsi	: PENENTUAN UMUR PANEN SEGAR DAN MASAK FISIOLOGIS BEBERAPA GALUR KACANG PANJANG WARNA MERAH.
Nama Mahasiswa	: NADIROH
Nomor Induk Mahasiswa	: 23020221120002
Program Studi/Departemen	: S-1 AGROEKOTEKNOLOGI/PERTANIAN
Fakultas	: PETERNAKAN DAN PERTANIAN

Telah disidangkan di hadapan Tim Penguji
dan dinyatakan lulus pada tanggal ..25..JUN..2025

Pembimbing Utama

Prof. Dr. Ir. Florentina Kusmiyati, M.Sc.

Pembimbing Anggota

Bagus Herwibawa, S.P., M.P.

Ketua Program Studi

Dr. Ir. Eny Fuskhah, M.Si.

Ketua Panitia Ujian Akhir Program

Bagus Herwibawa, S.P., M.P.

Dekan

Prof. Sutiharto, S.Pt., M.Sc., Ph.D.

Ketua Departemen

Ahmad Ni'matullah Al–Baarri, S.Pt., M.P., Ph.D.

SUMMARY

NADIROH. 23020221120002. 2025. DETERMINATION OF FRESH HARVEST AGE AND PHYSIOLOGICAL RIPENING OF SEVERAL RED LONG BEAN LINES (Supervisor: **FLORENTINA KUSMIYATI** and **BAGUS HERWIBAWA)**

The study aimed to assess the fresh harvest and physiological maturity of red long bean lines at several harvest ages. The study was conducted in Sumbersoko Village, RT.10/RW.01, Sukolilo, Pati and the Plant Physiology and Breeding Laboratory, Faculty of Animal and Agricultural Sciences, Universitas Diponegoro, from November 2024 to February 2025.

The research design used was a split plot design *applied* to a randomized block design with 7 F7 generation long bean lines (FA 1–1–4–3–6–8–B, FS 3–4–7–1–B, FA 3–2–13–14–B, FA 1–1–5–3–18–B, FA 1–1–10–1–6, FS 3–4–10–3–B And FS 3–4–8–2–B), elders long beans (Fagiola IPB and Aura Hijau) as the main plot, and harvest time (8, 11, 14, 17, 20, 23, 26, 29, 32 And 35 day after anthesis (HSA)) as a child plot. Test repeated 3 time, parameter Which observed that is long pods, fresh weight of pods/plant, number of pods/plant, number of seeds/pod, germination capacity, seed water content, sweetness level, pod shelf life, pod shape, texture pod, color pod, color end pod, color seed main, secondary seed color and seed shape. Qualitative data were analyzed descriptively, quantitative data were analyzed descriptively. use *Analysis of Variance* Which to be continued test Different Real Honesty level 5%, as well as correlation analysis and path analysis.

The results of the study indicate that the lines have different qualitative and quantitative characteristics at certain harvest ages. Fresh harvesting produces red-purple pods (*greyed-purple group* RHS 187 *and purple group* RHS N77) with end pod green yellowish (*yellow-green* RHS *group* 145), while harvesting Cook physiological own color pod And color end pod brownish (*brown group* RHS 200). All producing strains seed color main and seed color secondary Which different. Line influential significant to The parameters were pod length, fresh pod weight/plant, number of pods/plant, seed weight/pod, and sweetness level. Harvest age had a significant effect on all parameters. The interaction between strain and harvest age had a significant effect on weight fresh pods/plants, amount pods/plants, Power germination, and sweetness level. A significant correlation and contribution were shown between sweetness level and the shelf life of fresh pods, as well as water content with germination power and seed number. The conclusion of this study is that there is a significant effect of harvest age on the shelf life of fresh pods. 8 And 11 HSA on 2 strain, 11 And 14 HSA on 3 strain, harvest 11 HSA on 1 line and harvest 8, 11 and 14 on 1 line. Physiologically ripe harvesting can be done age 20, 23 And 26 HSA on 3 strain as well as 20 And 23 HSA on 4 strain.

PREFACE

Determination of fresh harvest age and physiological maturity age is necessary for selected lines. in assembly varieties new plants long beans. The time of harvest and fresh conditions will affect the phytochemicals in the long bean pods. consumed, temporary time harvest physiological maturity influence the quality of the seeds that will be used as seeds in the next cultivation stage. Research This intended For study age harvest fresh And Cook physiological from red long bean strains at several harvest ages so that the right harvest time is obtained.

Praise be to God The Almighty for His mercy and His gifts, so that writer can finish study And writing thesis with good one titled "Determination Age Harvest Fresh And Cook Physiological a number of Red Long Bean Line" and. The author would like to express his deepest gratitude to all parties who have assisted in the research and preparation of this thesis:

1. Prof. Dr. Ir. Florentina Kusmiyati, M.Sc. as the Main Supervisor and Bagus Herwibawa, SP, MP as the Advisor Members for their guidance, suggestions and direction so that the research and preparation of this thesis can be completed.
2. Prof. Sugiharto, S.Pt., M.Sc., Ph.D. as Dean of the Faculty of Animal Husbandry and Agriculture, Ahmad Ni'matullah Al–Baarri, S.Pt., MP, Ph.D. as Head of the Department of Agriculture, Dr. Ir. Eny Fuskhah, M.Si. as Head of the Undergraduate Program–Agroecotechnology, the author would like to express his gratitude for the opportunity

which was given to the author to pursue undergraduate education in the S–1 Agroecotechnology study program.

3. Prof. Dr. Ir. Sumarsono, MS (Deceased) as Advisor (2021–2023) and Muhammad Iqbal Fauzan, SP, M.Si. as Lecturer Guardians (2023–2025) who have been the author's parents during the study period.
4. All over ranks lecturer Program instructor Studies Agroecotechnology Prof. Dr. Ir. Syaiful Anwar, M.Sc., Prof. Dr. Ir. Florence Kusmiyati, M.Sc., Prof. Ir. Didik Wisnu Widjajanto, M.ScRes, Ph.D., Dr. Ir. Susilo Budiyanto, M.Sc., Ir. Karno, M.Appl.Sc., Ph.D., Dr. Ir. Eny Fuskhah, M.Sc., Bagus Herwibawa, SP, MP, Rosyida, SP, M.Sc., A'isyah Surya Bintang, SP, M.Sc., Muhammad Ghazi Religion Sas, SP, M.Sc., Fajrin Pramana Son, SP, M.Sc., Muhammad Iqbal Fauzan, SP, M.Si., Septrial Arafat, SP, MP, Dr. Dian Safitri, SP, M.Si., Albertus Fajar Irawan, SP, M.Agr., Ph.D., Anasrullah, SP, MS, Chaieydha Noer Afiefah, SP, M.Sc., Nani Kitti Sihaloho, SP, MP, Prof. Dr. Ir. Dwi Retno Lukiwati, MS (Retired), Prof. Dr. Ir. Endang Bi Purbajanti, MS (Retired) Task), Dr. Ir. Budi Adi Kristanto, MS (Retired), Dr. Ir. Sutarno, MS (Retired), and Prof. Dr. Ir. Sumarsono, MS (Deceased), who have provided knowledge, guidance and a lot of experience to the author during his studies.
5. Sri Bima Arya Teja, A.Md., Ahmad Baroha, S.Pt. and Iskandar, A.Md., as staff and employees in the Faculty of Animal and Agricultural Sciences, Education Staff and Laboratory Administrators of the Agroecotechnology Undergraduate Study Program who have assisted in the research process.

6. Mr. Suyoto and Mrs. Muinah as the author's father and mother, Wiwik Supriyantini, Dewi Kumala Sari, Saudi, Supranoto, Faiz Sayful Ma'arif, Shabrina Azzahra, Jenny Syakayla Nadria, as the author's sister and niece who have provided assistance, support and encouragement during the author's studies.
7. Dear friends of Satria Ardhana Kusuma Adi, Krismadiana, Fransiska Elsa Permatasari, Nur Hasanah, Tri Astuti Fauziani, Rizka Hanafiyah, Shofi Saida Septiana and Muhammad Fathin Harits, who have provided support and accompanied the author in facing the world of college.
8. The Bidikmisi KIP Kuliah family has provided support during the author's studies until completing this thesis.
9. All parties that the author cannot mention one by one, thank you. Thank you for your help during the research process and the preparation of this thesis.

realize thesis This Still Far from perfect. By Because That,

The author really hopes for constructive criticism and suggestions. Finally, writer hope hopefully thesis This can be useful for all the party in need.

Thus the foreword from the author, and the author expresses his gratitude for the attention and suggestions and input from various parties.

Semarang, June 2025

Writer

LIST OF CONTENTS

PREFACE vi

TABLE OF CONTENTS ix

LIST OF TABLES xi

LIST OF ILLUSTRATION xiii

LIST OF APPENDIX xiv

CHAPTER I INTRODUCTION..... 1

1.1. Background 1
2.2. Objective And Benefits..... 3
2.3. Hypothesis Study 3

CHAPTER II LITERATURE REVIEW 4

2.1. Peanut Length..... 4
2.2. Genealogy Line Which Researched 6
2.3. Agronomic Characterisics 8
2.4. Age Harvest..... 9

CHAPTER III MATERIAL AND METHOD 12

3.1. Time And Place Implementation 12
3.2. Material Research 12
3.3. Method Research 13

CHAPTER IV RESULTS AND DISCUSSION 29

4.1. Condition General Location Research 29
4.2. Character Qualitative 32
4.3. Quantitative Character.....46
4.4. Discussion General 67

CHAPTER V CONCLUSION AND SUGGESTION 76

5.1. Conclusion 76
5.2. Suggestion 76

REFERENCE.....77

APPENDIX 84

HISTORY LIFE 209

LIST TABLE

Page Number

1. Fingerprint Variety Line Character And Harvest ..... Age 24
2. Results Analysis Land 29
3. Average Temperature And Humidity Daily Village Sumbersoko Period Month December 2024–February 2025 31
4. Form Pod Plant Peanut Length 32
5. Texture Pod Plant Long .....Beans 34
6. Form Seed Plant Peanut Length 36
7. Color Bean Pods Length 37
8. Color End Pod Peanut Length 39
9. Color Seed Main Peanut Length 41
10. Color Seed Secondary Long .....Beans 44
11. Recapitulation Results Character Variety Print Quantitative Influence Lines and Harvest ..... Age 46
12. Recapitulation Results Fingerprint Variety Character Quantitative Influence Interaction Line And Age Harvest 47
13. Results Test Carry on Different Real Honest Parameter Pod Length 48
14. Results Test Carry on Different Real Honest Weight Parameters Pod Fresh per plant 50
15. Results Test Carry on Different Real Honest Number Parameter Pod per Plant 52
16. Results Test Carry on Different Real Honest Shelf Life Parameters Pod Fresh 54
17. Results Test Carry on Different Real Honest Parameters Level Sweetness 56

18. Results Test Carry on Different Real Honest Parameter Weight Seed per Pod 59

19. Results Test Carry on Different Real Honest Number Parameter Seed per Pod 60

20. Results Test Carry on Different Real Honest Parameter Level Water Seed 62

21. Results Test Carry on Different Real Honest Parameters Power Germinate 64

LIST ILLUSTRATION

Number		Page
1.	Method Measurement Long Bean Pods Long.	17
2.	Variety Form Pod Peanut Long	20
3.	Variety Texture Pod Long beans	20
4.	Color Pod Peanut Long	21
5.	Color End Pod Peanut Long	21
6.	Color Main Seed Peanut Long	22
7.	Color Secondary Seed Peanut Long.....	22
8.	Variety Form Bean Seeds Long	23
9.	Location Study	29
10.	Difference Form Bean Pods Length 32	
11.	Difference Texture Pod Long .....Beans 34	
12.	Difference Form Seed Peanut Length 36	
13.	Seed Peanut Long Which Damaged And Rotten 42	
14.	Proportion Seed Color Main and Seed Secondary Peanut Length 45	
15.	Matrix Correlation Between Quantitative .....Parameters 67	
16.	Diagram Track Parameter Determinant Harvest Fresh 70	
17.	Diagram Track Parameter Determinant Harvest Physiological Cooking 72	

LIST ATTACHMENT

Number		Page
1.	Genealogy from Strains Hope Which Researched.	85
2.	Description Variety Fagiola IPB	86
3.	Description Variety Aura Green	87
4.	Calculation Need Fertilizer	88
5.	Documentation Study	89
6.	Data Temperature And Humidity Period December 2024 until January 2025	91
7.	Character Qualitative Line Hope And Elder Plant Peanut Long	92
8.	Long Bean Pod Varieties of the Hope Line and the Parental Lines of Long Bean Plants.....	93
9.	Study of Variation in Fresh Pod Weight per Plant of Promising Lines and Parent Long Bean Plants.....	104
10.	Fingerprint Variety Amount Pod per Plant Line Hope and Elder Plant Peanut Long on Harvest First And Second	117
11.	Fingerprint Variety Age Save Pod Fresh Line of Hope And Elder Plant Peanut Length	129
12.	Analysis of Sweetness Level Variation of Promising Lines and Parental Long Bean Plants	141
13.	Fingerprint Variety Weight Seed per pod Line of Hope And Elder Plant Long	Beans 158
14.	Fingerprint Variety Amount Seed per pod Hope Line and Elder Plant Long	Beans 173
15.	Fingerprint Variety Seed Water Content Line of Hope And Elder Plant Peanut Length	181

16. Germination Variation Analysis of Promising Lines and Parental Long Bean Plants 189

17. Results Calculation Correlation Coefficient and Path 206

18. Experiment .....Layout 207

CHAPTER I

INTRODUCTIO

N

1.1. Background Behind

Long beans (*Vigna sinensis* L.) are a popular vegetable in Indonesia and a source of vitamins and minerals. Long bean pods Also contain protein vegetable. Contents average protein on The proportion of long bean pods and seeds is 15.25% (Yuliani and Fitriyah, 2018). The many benefits of long beans make them quite popular. Long bean production in Indonesia reached 309,422 tons in 2023, but decreased by 14.26% to 360,871 tons in 2022 (Directorate General of Horticulture, 2024). The decline in long bean production is largely influenced by environmental factors and cultivation techniques. done. Production peanut long often use seed local or seeds from previous plantings so that the quality is less than optimal. Use seed from planting previously have the opportunity to bring pathogen contamination, such as In peanut plants, seeds cause streak disease due to seeds contaminated in the previous planting season (Milk *et al* ., 2023). Efforts to improve the genetic quality of long beans are necessary to increase long bean productivity.

Efforts that can be made to increase long bean productivity include improving genetic traits. Genetic traits can be improved. through activity breeding plant so that obtained varieties new

Which unique And own superior qualities (Koryati *et et al* ., 2022). Pod peanut long generally colored green or green vaginal discharge and red which has content anthocyanin high. Anthocyanin is giving substance color, plant protector from stress biotic And abiotic, And as photoprotector to UV-B radiation (Priska *et al.* , 2018). The high anthocyanin content in long beans with red pods is not balanced with a sweet taste. One of the various One technique for improving genetic traits that can be done is through cross-breeding. Previous research has conducted cross-breeding using several long bean parents, namely the Aura Hijau variety (green pods), the Fagiola IPB variety (purple pods), and Super White variety (whitish green pods) so as to produce promising lines.

Determination of fresh harvest age and physiological maturity age is necessary for the lines. hope in assembly varieties new plant peanut long. The harvest time of fresh bean pods will affect the phytochemicals in the long bean pods. consumed, temporary time harvest Cook physiological influence The quality of the seeds that will be used as seeds in the next cultivation stage. Calculation of the harvest age of long bean plants can be calculated based on the time of flowering. Fagiola IPB long beans will flower at 30 days after anthesis and the initial harvest at 18 days after planting (DAP) with dark purple, oval-shaped pods weighing 33.77–36.01 grams (Reswari *et al* ., 2019). Harvesting carried out 26 days after anthesis (DAP) has the highest germination rate and low water content (Mayun *et al* ., 2021).

1.2. Objective And Benefit

The aim of this study was to examine the fresh harvest age and physiological maturity. from strains peanut long colored red. Benefit from this research is can be resources about harvest age fresh and physiological maturity of red long bean lines compared with reference varieties.

1.3. Hypothesis Study

Hypothesis study This is:

1. All strains hope to have the best yield potential compared to the comparison varieties.
2. The harvest age treatment of 18 days after anthesis (HSA) and the treatment of 26 HSA are the best fresh and physiologically ripe harvest ages.
3. Interaction all over strain with age harvest 18 HSA And 26 HSA is the best treatment.

CHAPTER II

REVIEW LIBRARY

2.1. Long beans

Long beans (*Vigna sinensis* L.) are a horticultural crop widely used for their pods and seeds. This plant originates from India and Central Africa and grows well in tropical regions (Haryanto *et al.,* 1999). The USDA (1927) classification of long beans is as follows:

Kingdom : Plantae

Division : Magnoliophyta

Class : Magnoliophyta

Order : Fabales

Family : Fabaceae

Genus : Vigna

Species : *Vigna sinensis* L.

Long beans can grow in both lowlands and highlands. Growing requirements peanut length, namely on height 0 – 1500 meters above sea level, temperature average temperature of 18 – 32 ° C, rainfall of 600 – 2000 mm/year and soil pH ranging from 5.5 – 6.5 (Nisa, 2022). Long bean cultivation can use cow manure as a base fertilizer with a dose of 20 tons/ha (Fitriana *et al* ., 2022). Dosage fertilizer inorganic For plant peanut length, namely 36.8 kg N/ha, 36.8 kg P_2O_5 /ha, and 64.5 kg K_2O/ha (Al–Furtuse *et al* ., 2019).

The distinctive growth characteristics of long bean plants are their elongated pods. Long bean plants have climbing stems, Which the surface is slippery with leaf compound shaped trifoliate and edge The flowers are flat, with butterfly-shaped flowers and are compound flowers that grow in the leaf axils. The roots of the long bean plant are light brown taproots, while the pods are between 10 αvδ 80 cm long, green when young and pale yellow when mature (Ami and Candra, 2019). Long bean seeds have primary and secondary colors in some varieties. Long bean seeds are flat and arranged in pods.

Long bean seed quality includes genetic, physical, and physiological qualities. According to *the International Seed Testing Association,* seeds with a germination rate of 80% meet seed quality standards. (ISTA, 2007). Level water seed maximum on class seed spread is 11 % with a pure seed percentage of 98% and a maximum of 2% seed impurities (Directorate of Horticultural Seeds, 2012). Storage of seeds with low to moderate water content (<11%) must be stored in vapor-resistant packaging materials such as aluminum foil (Lastriyanto *et al* ., 2016).

The quality of long bean seeds is influenced by internal and external factors during the cultivation and seed production process. Water content during seed storage affects seed deterioration, where excessive water content... tall can cause germinated seeds before planted Which can cause finished reserves food on seed. Factor other Which

influence Power germinate is quality seed before saved, And seed water content (Kartono, 2004).

2.2. Genealogy Strains Which Researched

The assembly of long bean lines with red pods has been carried out in research previously, as results cross between the long bean varieties Fagiola IPB, Super White, and Aura Green. The pedigree of the lines studied can be seen in Appendix 1. The F1 generation produced the same color of pods. Which almost The same with elders the female so that done selection for results Which pods red (Solekhati, 2018). Results Which obtained on generation F1 was then replanted as the F2 generation. F2 generation produced 11 genotypes results Crossing of Fagiola IPB and Super Putih (FS) and 11 genotypes resulting from crossing between Fagiola IPB and Aura Hijau (FA) which were then planted with 9 plants each (Rachmawati *et al* . 2020)

Selection was carried out on the F3 generation using the single seed descent method by taking one seed from each plant to be replanted. generation furthermore (Thank you *et al* ., 2018). Results cross Fagiola IPB and Green Aura in the F3 generation produced high heritability on the number character leaf And own character positive on character amount branch And number of pods, amount leaf And amount branch, as well as character long pod And number of seeds (Kusmiyati *et al.,* 2021).

Results generation F3 planted return as generation F4, then carried out in stages selection to character color pod red. Generation F4 planted 7

FS seed genotypes and each genotype is planted 16 FA plants and seeds Six genotypes were planted with 16 plants per experimental unit. The F4 generation produced long bean plants with red pods and high genetic diversity in the number of pods, number of seeds per plant, and seed weight per plant, while also obtaining high heritability. on all character except age flowering And *brix* or level sweetness of seeds (Bakhtiar, 2020).

The seeds τηατ have been selected in the F4 generation are collected to be planted again in the F5 generation. A total of 9 genotypes resulting from the cross between Fagiola IPB x Super Putih and 9 genotypes resulting from the cross between Fagiola IPB x Aura Hijau was replanted to form the F5 generation. The results showed high heritability in leaf number, pod number, and seed number per plant.

The F6 generation of long bean plants with red pods produced diversity. Low genotypic and phenotypic diversity was observed in all traits except the number of seeds per plant in the F6 generation, while all over character experience progress selection except character The harvest age of the consumption pods, and the weight of 100 grains experienced selection setbacks (Shintawati *et al.* , 2022). The results obtained in the F6 generation were replanted as the F7 generation. A total of 5 genotypes resulting from the cross between Fagiola IPB x Super Putih and 8 genotypes resulting from the cross between Fagiola IPB x Aura Hijau replanted 24 plants. The F7 generation showed several strains that were unstable in terms of plant height, pod number, pod weight, and productivity. amount seed, And weight seed, temporary stability most tall there is

in the FS 3 – 4 – 14 – 2, FS 3 – 4 – 8 – 2, and FS 3 – 4 – 10 – 1 lines (Widaryati, 2022). The success rate of plant assembly is influenced by the intensity of selection. The purple color controlling gene will be more effective with a high selection intensity, so that the proportion population 9/16 purple color can be selected entirely from the proportion of 7/16 red color in the pod color character (Latief, 2018).

2.3. Character Agronomy

Agronomic characters is characters that show potential yield plants, which include character tall plants, harvest age, quantity productive branches, number pods, seed weight dry, weight 100 grain dry And number of seeds per plant (Ardian *et al.,* 2016). Character agronomy can differentiated into two, namely qualitative characters and quantitative characters.

Character qualitative controlled by One or two genes And is main characteristics that are not affected by the environment (Azka and Sayekti, 2020). Qualitative characters Wrong the other one is color. Purple color on the pods and The color of long bean stems is due to the presence of anthocyanins in these parts. Long beans with purple stems and pods, with the deepest purple color, have a high anthocyanin content of up to 189.54 ppm (Cahyaningrum *et al* ., 2014). This anthocyanin can be an attractant for pollinating insects and functioning as agent protection from various dangerous pathogens (Pervaiz *et al.,* 2017).

Quantitative characters such as number of pods, pod weight are generally controlled by Lots gene. Character amount pod, weight pod, And long

pods have high yields due to the large number of genes involved in them. variables results which cover genes who controls roots, absorption hara, character leaves, and speed photosynthesis (Simarmata *et al* ., 2015). Character Plant height, number of leaves, and other quantitative traits are usually influenced by the female parent. The female parent is another factor that influences the inheritance of traits. production in outside chromosome Which lowered through the cytoplasm (Daughter *et et al* ., 2015).

The characters that appear in long bean plants can also be influenced by factors environment for example the number branches, harvest age dry pods, 100-grain weight, and sweet taste. Long bean genotype testing showed low heritability results in the number of branches, dry pod harvest age, 100-grain weight, and sweet taste, which was caused by higher phenotypic diversity values than genotypic diversity (Hastuti *et al* ., 2016).

2.4. Age Harvest

Harvest age in long bean plants is a quantitative character. Which influence quality from seed Which produced or The pods consumed. Harvest age is quite important in the process of developing new plant varieties because it can indicate the genetic characteristics of a plant. harvest peanut long varies depends on characteristics genetics, Besides that varieties Which more new tend more responsive to practice agronomy

intensive, such as irrigation And fertilization, which directly affects the harvest age (Arivudainambi *et al.* , 2020).

Calculation age harvest plant peanut long can counted Based on flowering time. Flowering time in long beans is generally 36 days after planting. Flower initiation in long beans occurs 36 days after planting and begins flowering at 49 days after planting, depending on the variety planted (Rizkyma and Ariyanti, 2023). The Fagiola IPB variety used as comparison elders have early age flowering, namely 30 HST (Days After Planting). Description of the parent variety Fagiola IPB and Green Aura can be seen in Appendix 2 and Appendix 3. Fagiola IPB long beans will flower at 30 HST and the start of harvest at 18 HSA with dark purple pods in an oval shape, the pods weigh 33.77–36.01 grams (Reswari *et al* ., 2019). Age harvest Also can influence quality seed Which produced Long bean plants. Harvesting at 26 days after anthesis (DAP) had the highest germination rate, dry weight, and water content (Mayun *et al* ., 2021). The 26-day DAP harvest treatment for the Pertiwi variety also affected physical quality, namely the weight per 1000 seeds, and physiological quality, namely the highest germination rate. (Pradnyawati *et al* ., 2019). Temporary That harvesting on age harvest 23 HSA conducted on long beans of KP-1 variety, KP-12 variety, and KP-15 variety produced the best results where the seed water content was in the range of 11%, soak seed 60-80%, Power grow as well as weight 1000 grains seed Which is appropriate (Kristanti and Ashari, 2020).

The criteria for freshly harvested long beans are those that have a sweet taste. Consumer preferences in selecting long beans include medium-length pods between 40–60 cm, and ripeness. medium pods, surface smooth, shiny and sweet pod flavor (Soetiarso and Marpaung, 1996). Freshly harvested long beans have The pods are crisp and some are lighter in color. Young pods tend to be softer, and the seeds are not fully developed, still small and soft. Fresh pods have a very high water content, so young-harvested long beans are fresher and widely used as a vegetable. Young pods contain high levels of phytochemicals, including vitamin C, fiber, and antioxidants such as flavonoids. (Choi *et al* ., 2024). Content The organic compounds in freshly harvested purple-podded long beans are protein and anthocyanin. The results of 15 purple-podded long bean lines from the result of crossing long beans of the Brawijaya variety and Cumbersome produce content anthocyanin reach 119.92 ppm And 3.53% protein with a pod length of 28 cm and the number of pods per plant is 17 pods (Paramitha *et al.* , 2018).

Long beans harvested at physiological maturity have harder pods, their color changes to a duller shade, often brownish or yellowish, and the seeds within the pods develop larger, harder, and fully mature. Long beans at this stage are more commonly used as seeds. Phytochemical content, such as protein and starch, is higher in mature beans, but vitamin C and antioxidant content decreases compared to young beans (Mahjabin *et al* ., 2015).

CHAPTER III

MATERIAL AND

METHOD

3.1. Time And Place Implementation

Study This implemented on month November 2024 until February 2025. The experiment was conducted in Sumbersoko Village RT.10/RW.01, Sukolilo, Pati, Central Java and the Laboratory of Physiology and Plant Breeding, Department of Agriculture, Faculty of Animal Husbandry And Agriculture, Diponegoro University, Semarang, Central Java.

3.2. Material Study

The materials used in this research include tools and materials. The materials used were long bean seeds of the Fagiola IPB variety and Green Aura as varieties comparator And 7 strain peanut long results selection on F7 generation (a cross between Fagiola x Super White (FS) and Fagiola x Green Aura (FA) where the female parent is Fagiola IPB), cow manure, Urea fertilizer, KCI fertilizer, TSP fertilizer, black silver plastic mulch, raffia rope, herbicide with active ingredients paraquat dichloride, insecticide made from active abamectin 2% + nitenpiram 30% to control lice kebul, insecticide made from active dimehypo 550 g/l and emamectin benzoal 50 g/l. The tools used were hoes, stakes, meters, sprayers, temperature and humidity gauges, RHS *color charts* , *brix refractometers* , analytical scales, mulching plongs, rulers, digital scales, stationery, and digital cameras.

3.3. Method Study

Experimental Design. This study used a Split Plot Design *applied* to a Randomized Block Design (RAK) with 7 F7 generation long bean lines and long bean parents of Fagiola IPB and Aura Hijau varieties as the main plot and different harvest times as subplots. The main plot consisted of 7 red long bean lines, namely FA 1 – 1 – 4 – 3 – 6 – 8 – B (G1), FS 3 – 4 – 7 – 1 – B (G2), FA 3 – 2 – 13 – 14 – B (G3), FA 1–1–5–3–18–B (G4), FA 1 – 1 – 10 – 1 – 6 (G5), FS 3 – 4 – 10 – 3 – B (G6) And FS

3 – 4 – 8 – 2 – B (G7) and 2 parents as comparison varieties, namely long bean seeds varieties Fagiola IPB (G8), varieties Aura Green (G9). Child plot consists of out of 10 treatment age harvest that is 8 HSA 11 HSA, 14 HSA, 17 HSA, 20 HSA, 23

HSA, 26 HSA, 29 HSA, 32 HSA and 35 HSAs. There were 90 treatment combinations with 3 replications so there were 270 experimental units. Three plants were planted in each experimental unit, resulting in a total of 810 long bean plants. The research layout can be seen in Appendix 18.

Research procedures. The research was conducted in several stages, namely research preparation, land preparation, planting, watering, pest control, weeding and replanting, staking, fertilization, harvesting young and physiologically ripe plants, and observation. parameters, retrieval data, analysis and data processing. The research procedures can be seen in Appendix 5.

Preparation includes preparation tools and selection of promising λινεσ from generation F7 Which tested. Generation F7 Which planted that is strain FA

1 – 1 – 4 – 3 – 6 – 8 – B(G1), FS 3 – 4 – 7 – 1 – B(G2), FA 3 – 2 – 13 – 14 – B(G3), FA

1 – 1 – 5 – 3 – 18 – B(G4), FA 1 – 1 – 10 – 1 – 6(G5), FS 3 – 4 – 10 – 3 – B(G6) And FS

3 – 4 – 8 – 2 – B(G7). The comparison variety seeds of Fagiola IPB were obtained from the seed class spread the Already in commercialize, while seed aura green obtained from the previous generation of planting seeds. Seeds from promising lines were first tested for germination to determine seed quality. Based on the tests conducted, the seven promising lines had an average germination rate of 86%, making them still suitable for planting.

Land preparation and mulching. The cultivated land is cleared of weeds and the soil is turned over using a hoe. The soil that has been processed Then made beds with size beds 9 m x 1 m with a distance between beds of 0.5 m. The beds that have been made are then given cow manure at a dose of 20 tons/ha. After the application of the manure, then installation And Mulch perforation. The mulch used is black silver mulch with holes drilled at a distance of 50 cm x 50 cm.

Planting. Planting is carried out 7 days after applying the base fertilizer. Planting is done by placing 2–3 seeds in each hole, with a spacing of 50 cm x 50 cm.

Stitching And thinning. Stitching done moment plant 7 days after planting. The replanting was done in the afternoon. The replanted seedlings were seeds Which dead or slow its growth. Thinning plant

This is done when the plants are 14 days old after planting by pulling out or cutting the plants so that one plant remains in each planting hole.

Control of pest organisms plants. Control Pests can be controlled using insecticides. The insecticides used are Symbisect 2/30 WG insecticide with the active ingredients Abamectin 2% + nitenpiram 30% to control whiteflies, which are applied to plants 28 days after planting (DAP), and Ulate 550 SL insecticide. active ingredients dimehypo 550 g/l and emamectin benzoal 50 g/l to control leaf caterpillars and pod borers which are applied to 48 HST. Spraying done on Morning or afternoon day with interval Every 2–4 days after signs or symptoms of infestation are detected. Weed control can be carried out by routine weeding once a week.

Staking and propagation. Installing stakes on long bean plants done on 10–15 day after planting. Stake Which used made made of bamboo, 2 meters long. Each plant is given one stake and propagated by wrapping the main stem around the stake.

Fertilization. Fertilization was carried out using basic fertilizer in the form of cow manure at a dose of 20 tons/ha (Fitriana *et al ., 2022). Then continued with inorganic fertilizer at* a dose of 36.8 kg N/ha, 36.8 kg P_2O_5 / ha, and 64.5 kg K_2O / ha (Al–Furtuse *et al* ., 2019). Follow-up fertilization of long bean plants was carried out when the plants were 14 days old and 28 days after planting (DAP) with ½ dose given in follow-up fertilization 1 and the remaining ½ dose in follow-up fertilization 2.

Harvesting. Harvesting was carried out according to the harvest age treatment, with a harvesting intensity of two harvests. The flowers produced on the long bean plants were marked with different thread markers to indicate the flowering age of the pods formed. Flower observations were conducted every morning. Quantitative data were collected at the first and second harvests, while color data were collected at the second harvest.

Parameter study. Parameter Which observed on study This that is:

A. Parameter Environment

1. Temperature

Temperature is measured using *a thermohygrometer* every day. in the morning (7:00 a.m. WIB), midday (12:00 p.m. WIB), and evening (5:00 p.m. WIB). The average daily temperature is calculated using the formula:

$$\text{Temperature daily average } (^{o}C) = \frac{2T1}{+T2+T3} \quad \text{.....(1)}$$

$$4$$

Information:

T1 = Morning temperature (^{o}C) T2 = Temperature Afternoon (^{o}C) T3 = Afternoon temperature (^{o}C)

2. Humidity Air

Humidity air counted use *thermohygrometer* every day in the morning (o'clock 07.00 WIB), Afternoon (o'clock 12.00 WIB) , And afternoon day (o'clock 17.00 WIB). The average daily air humidity is calculated using the formula:

$$\text{Humidity air average daily (\%)} = \frac{2K1 + K2 + K3}{4} \quad \text{.....(2)}$$

Information:

K1 = Morning air humidity (%) K2

= Humidity air Afternoon (%) K3 =

Afternoon air humidity (%)

B. Parameter Quantitative

1. Long Pod (cm)

Pod length is obtained by measuring all pods using a meter at each harvest time and then averaging them. Pod length measurement done on harvesting First And second. Measurement long Long beans can be seen in Illustration 1.

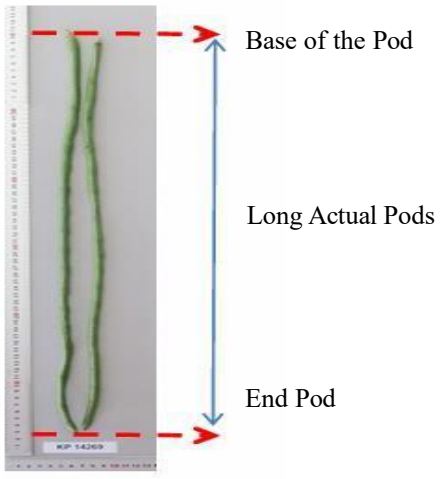


Illustration 1. Method Measurement Long Pod Peanut Long (PVTPP, 2024).

Criteria long pod namely: 1:

very short (<25 cm)

3: short (35.1 – 45 cm)

5: medium (55.1 – 65

cm) 7: length (75.1 – 85

cm)

9: very long (>95 cm)

2. Weight Fresh Pod per Plant (g)

The fresh weight of the pods is calculated by weighing the pods that have been harvested according to the harvest age.

3. Amount Pod per Plant (pod)

The number of pods per plant was obtained by counting the number of pods at the first and second harvests according to the predetermined harvest age. The number of pods counted was the number of pods successfully observed at each harvest age, then averaged across each replication.

4. Amount Seed per Pods (seeds)

The number of seeds per pod is obtained by counting the number of seeds in each pod.

5. Seed Weight per Pod (g)

Seed weight per pod was obtained by weighing the seeds on each sample plant.

6. Power sprouts Seed (%)

Seed germination is carried out using the Rolled Paper on Plastic Test (UKDdp) with how to grow 20 seed on paper straw Then, it was calculated at 7 days after sowing for all lines according to harvest age. The long bean seeds used were harvested directly without prior drying. Germination rate was calculated using the following formula:

$$\text{Power germinate} = \frac{\text{Amount seed germinate normal}}{\text{Total seed Which germinated}} \text{ x } 100 \quad \text{.....(3)}$$

7. Level Water Seed (%)

Water content is calculated based on the water content of dried seeds. Water content seed Which counted is seed on pod every time harvest per strain treatment. Seed Which used that is seed results harvesting direct, Which has calculated wet weight and semi-dry weight before Oven-dried without drying. One sample was measured for water content in each experimental unit. The moisture content measurement steps involved placing the seeds in an oven at 105°C for 6 hours, then calculating the water content using the formula.

Formula count level water seed that is (Ningsih *et al* ., 2018):

$$\text{Level Water (\%)} = \frac{Y - Z}{Y - X} \times 100\% \quad \text{.....(4)}$$

Information:

X = Weight receptacle (g)

Y = Container weight + sample weight wet (g)

Z = Weight receptacle + weight sample dry (g)

8. Shelf Life Pod Fresh (Day After Harvest)

The shelf life of the pods is obtained by recording the time the long bean pods experience decay after done harvesting. Age save Pods are said to be zero if the pods are rotten or dry.

9. Level Sweetness (Brix)

Sweetness is measured using a *Brix test* using a *refractometer* . The fruit flesh is crushed with a spoon, then the liquid is taken and dripped onto the *refractometer* . The *refractometer* is then held up to a light source so the reading is visible to the naked eye.

C. Parameter Qualitative

1. Form Pod

The pod shape is divided into three types along with their notations, namely pointed (1), pointed-blunt (2), and blunt (3). The variety of pod shapes of long bean plants can be seen in Illustration 2.

(Pointed) (Pointed Blunt) (Blunt)

Illustration 2. Variety Form Pod Peanut Long (PVTPP, 2024).

2. Texture Pod

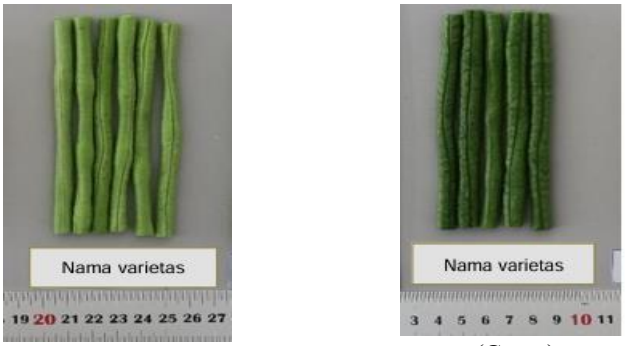
Surface texture is divided into three types along with their notations, namely smooth (3), slightly rough (5), and rough (7). The variety of textures of long bean pods can be seen in Illustration 3.

(Fine) (A bit rough) (Rough)

Illustration 3. Variety Texture Pod Peanut Long (PVTPP, 2024).

3. Color Pod

Observations were made on the pods after harvest. Pod color was determined by comparing them to the color chart on *the Royal Horticultural Society* (RHS) *Color Chart.* The color of long bean pods can be seen in Illustration 4.



(Green Young) (Green)

Illustration 4. Color Pod Peanut Long (PVTPP, 2024).

4. Color End Pod

The color of the pod tip is obtained by comparing The color of the pod tip corresponds to the color on the RHS *Color Chart.* The color of the pod tip can be seen in Illustration 5.

Illustration 5. Color End Pod Peanut Long (PVTPP, 2024).

5. Color Main Seed

Color seed main obtained with compare color seed main with color on RHS *Color Chart.* Color main seed peanut long can seen in Illustration 6.

Illustration 6. Color Main Seed Peanut Long (PVTPP, 2024).

6. Color Secondary Seed

The primary seed color is obtained by comparing the secondary seed color with color at RHS *Color Chart.* Color secondary seeds peanut long can be seen in Illustration 7.

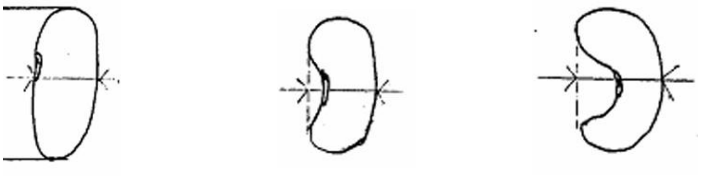
(Chocolate)

Illustration 7. Color Secondary Seed Peanut Long (PVTPP, 2024).

7. Form Seed

The observed seed shape is the shape found in the longitudinal section. middle seed. There is four type form along with the notation yes oval

(1), kidney (2), And curved (4). Form seed peanut long can seen in Illustration 8.



(Oval) (Kidney) (Curved)

Illustration 8. Variety Form Seed Peanut Long (PVTPP, 2024).

Analysis data

Split Plot Design applied to the Randomized Block Design (RBD) is as follows:

$$Yijk = \mu + \rho k + \alpha i + \gamma ik + \beta j + (\alpha\beta)ij + \varepsilon ijk$$

Information:

Yijk = Results observation on unit test kth which received the treatment of the ith main plot ανδ τηε jth subplot

μ = Value middle population

ρk = Influence additives from group to–k

αi = Influence additives from main plot on level i

βj = Additive effect of the subplot at the jth λεϖελ

(αβ)ij = Influence of interaction level i-th from main plot and level to–j from subplot

γik = Influence random from main plot that appears on level to – i from subplot factor in the kth γρουπ

εijk = Influence random from unit test to – k which get treatment combination of treatments i and j.

i,j,k = 1,2,3,…,n

Analysis of variance was conducted to show agronomic diversity in change strain And age harvest peanut long Formula estimation diversity can be seen in Table 1.

Table 1. Fingerprint Variety Character Line And Harvest Age

Source Diversity	Degrees Free	Amount Square	Square Middle	F Count	F Table
Plot Main					
Group (r)	r–1	JKK	KTK	KTK/KTE(g)	F(0.05, (dbk, dbe)
Line (g)	g–1	JKG	KTG	KTG/KTE(g)	F(0.05, (dbg, dbe)
Error $_{(g)}$	(r–1)(g–1)	JKE(g)	KTE(g)		
Subplot					
Age Harvest (p)	p–1	JKP	ID card	KTP/KTE(p)	F(0.05, dbp, dbe)
GxP Interaction	(p–1)(g–1)	JKI	KTI	KTI/KTE(p)	F(0.05, dbi, dbe)
Error $_{(p)}$	(r–1)((p–1)+ ((p–1)(g–1)))	JKE(p)	KTE(p)		
Total	(pgr)–1	Jakarta			

Factor Correct (FK) $= \sum Yij)^2 / rgp$ .....(4)

JK Total (JKT) $= \sum ij\ k\ Yijk^{2-} FK$ .....(5)

JK Group (JKK) $= \sum k\ (Yk^2 / gp) – FK$ .....(6)

JK Line (JKG) $= \sum i(Yi^2 / rp) – FK$ .....(7)

JK Error $_{(g)}$ (JKE $_{(g)}$) $= (\sum(g_i r_k)^2 / p) – FK – JKG$ .....(8)

JK Age Harvest (JKP) $= \sum j(Yj^2 / rgp) – FK$ .....(9)

JK Interaction G x P (JKI) $= \sum i\ j\ (Yij^2 / r) – FK – JKG – JKP$ .....(10)

JK Error $_{(p)}$ = JKT–JKK–JKG–JKE $_{(g)}$ –JKP–JKI .....(11)

KT Group (KTK) $= \frac{JKK}{db\ r}$. .....(12)

KT Line (KTG) $= \frac{JKG}{db\ g}$ .....(13)

KT Error $_{(g)}$ (KTE $_{(g)}$) $= \frac{JKE(g)}{db\ Error\ (g)}$ . .....(14)

KT Age Harvest (ID card) = $\frac{JKP}{db\ p}$ . .....(15)

KT Interaction GxP (KTI) = $\frac{JKI}{db\ interaction\ GxP}$ . ..... (16)

KT Error $_{(p)}$ (KTE $_{(p)}$) $= \frac{JKE(p)}{db\ Error\ (p)}$ . ..... (17)

F Count Group $= \frac{KTK}{KTE(g)}$ . .....(18)

F Count Line $= \frac{KTG}{KTE(g)}$ . .....(19)

F Count Age Harvest $= \frac{KTP}{KTE(p)}$ . .....(20)

F Count GxP Interaction = $\frac{KTI}{KTE(p)}$ . .....(21)

KK $_{(g)}$ $= \frac{\sqrt{KTE(g)}}{Average\ Total}$ x 100% ..... (22)

KK $_{(p)}$ $= \frac{\sqrt{KTE(p)}}{Average\ Total}$ x 100% ..... (23)

Variety Line ($\sigma^2 g$) = (KTG–KTE)/r ..... (24)

Variety Phenotype ($\sigma^2 f$) = $\sigma^2 g$ + KTE ..... (25)

Variety Error = KTE ..... (26)

Heritability ($h^2 bs$) = ($\sigma^2 g$ / $\sigma^2 f$) x 100% ..... (27)

Coefficient Diversity Genotype = $\frac{\sqrt{\sigma^2 g}}{X}$ x100% ..... (28)

Coefficient Diversity Phenotype = $\frac{\sqrt{\sigma^2 f}}{X}$ x 100% ..... (29)

Data results test fingerprint which has obtained to have mark significant or not significant. A significant group value indicates that environmental factors have an influence, if the value of the strain, harvest age and interaction are significant. so treatment those are different real. Results Which significant then further testing was carried out using the Honestly Significant Difference test at 5% level.

Hypothesis statistics

Hypothesis statistics Which tested in study is:

1. Influence factor plot main (Strain)

   H0 : $\alpha_1 = \alpha_2 = \alpha_3 = ... = \alpha i = 0$ (No There is influence difference line i against red long bean plants)

   H1 : minimum There is one $\alpha i \neq 0$ (There is) influence difference i-th line on red long bean plants).

2. Influence factor subplot (difference age harvest)

   H0 : $\beta_1 = \beta_2 = \beta_3 = ... = \beta j = 0$ (No There is influence difference harvest age to – j for red long bean plants).

   H1 : minimum There is one $\beta j \neq 0$ (There is) influence harvest age to – j against red long bean plants).

3. Influence interaction plot factor main with factor child plot

   H0 : $(\alpha\beta)_{11} = (\alpha\beta)_{12} = (\alpha\beta)_{13} = ... = (\alpha\beta)ij = 0$ (no interaction effect) strain i-th And age harvest to – j to plant red long beans).

   H1 : minimum there is one $(\alpha\beta)ij \neq 0$ (There is an interaction effect i-th line and age harvest to – j to plant peanut long red color).

Analysis correlation And analysis track

Correlation analysis is obtained by calculating the correlation coefficient between parameters. Correlation analysis is calculated using R Studio *software* . The correlation coefficient is obtained from the values of each parameter. Which found can worth positive and negative. Mark positive means a unidirectional correlation while a negative value means an inverse correlation.

0 : No There is correlation between two

Very weak correlation variable: 0–0.3

Correlation Enough : 0.3–0.5

Strong correlation : >0.5–0.75

Very strong correlation : >0.75–

0.99 Perfect correlation 1

Coefficient correlation can counted with formula:

$$r = \frac{\sum(X_i - \bar{X})(Y_i - \bar{Y})}{\sqrt{\sum(X_i - \bar{X})^2 \sum(Y_i - \bar{Y})^2}}$$ . .....(30)

Information:

r = Coefficient correlation between X

And Y n = number of data/samples

X = Mark variables x

Y = Mark variables y

$\dot{X}$ = Amount all over mark

x $\bar{Y}$ = amount all over mark

y

Analysis track (*path analysis*) done For know closeness of relationship between parameter in a way direct and No direct analysis this uses parameter level sweetness as variables bound which determine age harvest fresh And level water seed as variables bound to determine age Cook physiological. Mark coefficient track positive And highest between dependent variables with independent variables then you can be taken into consideration in determining connection best between parameter. Analysis track counted using R Studio *software . The analysis was carried out by means of* enter commands in language programming (*coding*) into the *worksheet* in R Studio. Input programming code can seen on Attachment 18. In a way mathematical analysis track can be analyzed use formula regression linear. Regression linear or The direct influence of the independent variable (X) on the dependent variable (Y) is as follows: $Y = b_0 + b_1 X_1 + b_2 X_2 + \ldots + b_i X_i + e$ ..... (31)

Information :

Y = Variables bound

X = Variables free

b = Coefficient track

directly e = error/residual

i = number variables free

CHAPTER IV

RESULTS AND DISCUSSION

4.1. Condition General Location Study

This research was conducted in Sumbersoko Village, Sukolilo District, Pati Regency. This area is located at an altitude of 265 meters above sea level. (masl) with wide region as big as 7.41 km ^{2} (BPS, 2023). Characteristics The soil at the research location can be seen in Table 2.

Table 2. Results Analysis Land.

Element	Level	Criteria*
N%	0.14	Low
P2O5 %	0.07	Very low
K2O %	0.04	Very low
pH	6.05	Rather sour

(*) Hall Study Land, 2009

Based on Table 2, it can be seen that the research location has good quality. land Which not enough well, thing This proven with content low and very low soil chemical elements. Soil pH value at the location research has criteria is a bit sour, will but Still fulfil condition grow long beans. According to Nisa (2022) condition grow peanut long that is on height 0 – 1500 meters above sea level, temperature average as big as 18 – 32 ^{o} C, rainfall Rain 600 – 2000 mm/year and pH land range between 5.5 – 6.5. Level elements chemistry land Which low can be met with addition material organic into the land through fertilization activities. The research location can be seen in Illustration 9.

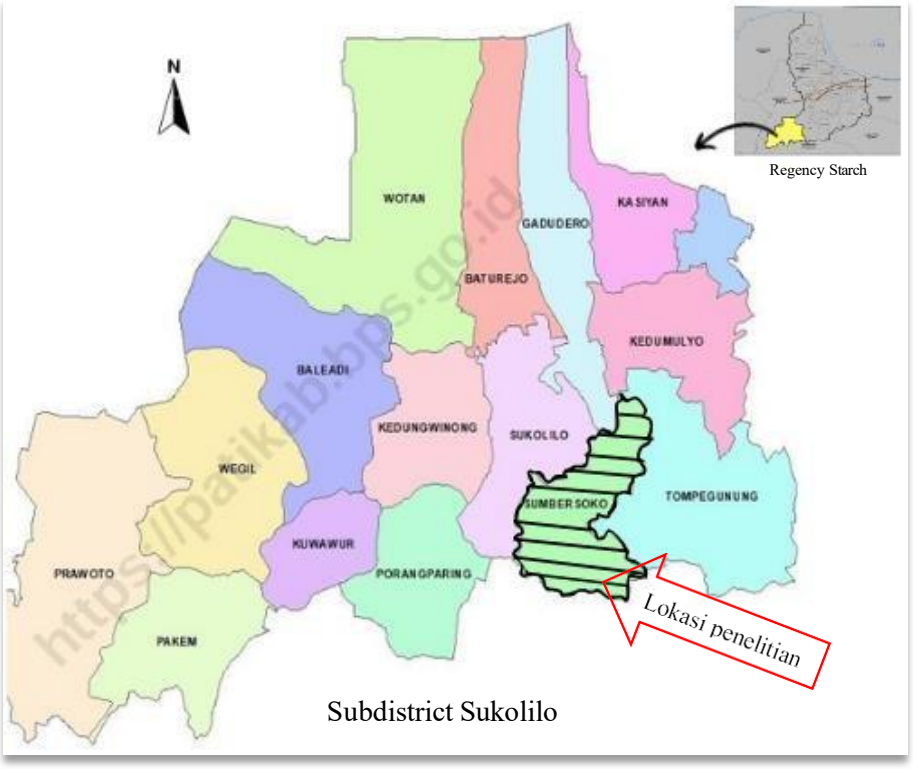


Illustration 9. Location Study

Body Center Statistics, 2023.

Sukolilo District has a flat, undulating, and hilly topography. It is crossed by limestone mountains, the Kendeng Mountains. Sumbersoko Village is one of the villages located within this mountainous region. The area, which comprises lowland to mid-latitude areas with a relatively cool environment, is optimal for growing long beans. Average monthly rainfall, temperature, and humidity at the study site are shown in Table 3.

Table 3. Average Temperature And Humidity Daily Village Sumbersoko Period December 2024–February 2025.

Month	Rainfall Rain (mm) [1]	Temperature (°C) [2]	Humidity (%) [2]
January	5,622	27.01	79.38
February	6,984	27.36	79.66
March	5.130	-	-
April	1,948	-	-
May	1,339	-	-
June	818	-	-
July	647	-	-
August	54	-	-
September	370	-	-
October	264	-	-
November	2487	-	-
December	2130	29.19	75.08

(1) Service Pusdataru 2023; (2) Data Primary Study Peanut Long Red 2024

Study implemented in Village Sumbersoko, Subdistrict Sukolilo, Pati Regency on month December 2024–February 2025. Temperature daily on location research can seen on Attachment 6. Based on observation temperature Which has conducted, it can be seen that the average daily temperature of the month ranges between 27.01–29.19 ° C. environment the suitable For growth peanut long. Condition weather in the month January–February experience increase rainfall rain, where in January as big as 5,622 mm/month temporary month February as big as 6,984 mm/month. This condition also increases humidity and impacts the pod drying process and several seed-related parameters. Increased humidity and high rainfall also result in less than optimal seed production.

Timing is crucial in seed production to prevent excessive rainfall during pod ripening. The flowering and pod formation processes are heavily influenced by the rainy season. According to Kristianti, And Ashari (2020) state that moment rainfall Rain tall, light

reduced sunlight, which results in photosynthesis not running perfectly and disrupts pod initiation resulting in pods with wrinkled and small seeds, or even seedless pods. Environmental factors that are not under control can influence growth And production plant. According to Khan *et al* . (2020) stated that factor the environment becomes Wrong one factor that influences flowering and impacts crop production. Seed production activities require solar heat to dry the pods, which will but rainfall Rain Which tall And intensity radiation sun Which less results in many seeds germinating in the pods. This is what causes the seeds produced experience decline quality and quantity.

4.3. Character Qualitative

4.3.1. Pod shape

The shape of the pods produced by the promising and parent lines consists of from There are two forms, namely pointed, blunt, and pointed. The results of the analysis of the shape parameters of long bean pods can be seen in Table 4 and Illustration 10.

Table 4. Form Pod Plant Peanut Long

		Age Harvest (HSA)									
		8	11	14	17	20	23	26	29	32	35
Line of Hope	FA 1–1–4–3–6–8–B	rt	rt	rt	rt	rt	rt	rt	rt	rt	rt
	FS 3–4–7–1–B	rt	rt	rt	rt	rt	rt	rt	rt	rt	rt
	FA 3–2–13–14–B	r	r	r	r	r	r	r	r	r	r
	FA 1–1–5–3–18–B	rt	rt	rt	rt	rt	rt	rt	rt	rt	rt
	FA 1–1–10–1–6	rt	rt	rt	rt	rt	rt	rt	rt	rt	rt
	FS 3–4–10–3–B	r	r	r	r	r	r	r	r	r	r
	FS 3–4–8–2–B	rt	rt	rt	rt	rt	rt	rt	rt	rt	rt
Comparison Varieties	Fagiola IPB	r	r	r	r	r	r	r	r	r	r
	Green Aura	RT	RT	RT	RT	RT	RT	RT	RT	RT	RT

Form pod r = Form Pointed And RT = Form Pointed Blunt.

Based on Table 4, it can be seen that the harvest age of 8 HSA to 35 HSA produces the same pod shape in each promising line. Based on this data, there are two promising lines that inherit the same pod shape. produced from elders fagiola, namely pointed And 5 strain hope which inherits the form pod elders aura green that is pointed blunt. Form pod strain FA 1–1– 4–3–6–8–B, FS 3–4–7–1–B, FA 1–1–5–3–18–B, FA 1–1–10–1–6 And FS 3–4–8–

2–B is pointed blunt, while FA strain 3–2–13–14–B And FS 3–4–10–3– B is blunt. The expression of qualitative characters that carry many ancestral traits indicates that these characters are more influenced by genetic factors than by the environment. According to Narendri *et al* . (2017), it states that character qualitative is character Which influenced by genes simple and environmental factors often do not affect the expression of these genes.

(Pointed) (Pointed–Blunt)

Illustration 10. Differences Form Pod Peanut Long

Based on Illustration 10, it can be seen that the shape of the pods produced from strain hope And elders peanut long There is 2 form that is sharp–blunt And blunt. Form pointed marked with part base pod pointed while blunt pointed at the base of the pod is more pointed. According to Center PVT (2014) form pod peanut long Which observed on

The base consists of pointed, pointed-blunt, and blunt, the pointed-blunt shape can be found in long beans of varieties KP3, KP-4, KP5, KP6, KP7, 77 and Hijau Super.

4.3.2. Texture pod

The texture of the pods produced by the promising strain is smooth and slightly rough. analysis parameter texture pod peanut long can be seen on Table 5. and Illustration 11.

Table 5. Texture Plant Pods Long beans .

		Age Harvest (HSA)									
		8	11	14	17	20	23	26	29	32	35
Line of Hope	FA 1–1–4–3–6–8–B	h	h	h	ak	ak	ak	h	h	h	h
	FS 3–4–7–1–B	h	h	h	ak	ak	ak	h	h	h	h
	FA 3–2–13–14–B	h	h	h	ak	ak	ak	h	h	h	h
	FA 1–1–5–3–18–B	h	h	h	ak	ak	ak	h	h	h	h
	FA 1–1–10–1–6	h	h	h	ak	ak	ak	h	h	h	h
	FS 3–4–10–3–B	h	h	h	ak	ak	ak	h	h	h	h
	FS 3–4–8–2–B	h	h	h	ak	ak	ak	h	h	h	h
Comparison Varieties	Fagiola IPB	h	h	h	ak	ak	h	h	h	h	h
	Green Aura	h	h	h	ak	ak	ak	ak	h	h	h

Texture pod h = (Smooth Texture) And ak = (Texture is a bit Rough)

Based on Table 5, it can be seen that the texture of the pods produced by the 7 promising long bean lines is uniform. The somewhat coarser texture of the pods in the promising lines was produced at harvest ages of 17, 20, and 23 HSA, while elders Fagiola IPB on 17 and 20 HSA, then elders aura green on 17 until 26 HSA. Texture pod rather rough formed Because development the seeds and pod skin are affected aging. Harvest age 8 to 14 DSA The texture of the pods of the Harapan line and the two parents is smooth, this is caused by the age of harvest Which Still young make seed in the pod No seen

stand out, so that it is minimal strokes on pod skin. Line hope Harvested at 26 to 35 days after planting (HSA), the texture of the Fagiola IPB variety is smooth, while the texture of the Aura Hijau variety is smoother at 23 days after planting (HSA) and the Fagiola IPB variety at 29 days after planting (HSA). This is because the pods have dried out, and the seeds within the pods have decreased in water content, preventing them from protruding to the surface.

The texture of the pods at harvest age 23 HSA is different from the fagiola parent, namely it is somewhat rough. The texture of the pods of the crossbred long beans can be... different from elders. Results similar Also happen on study Daughter (2015) that state that pod peanut long elders Striped And Chocolate Young has a harder texture compared to the cross-bred plants which is possibly influenced by *the maternal effect.*

(Fine)

(Rather Rough)

Illustration 11. Differences Texture Pod Peanut Long

Based on Illustration 11. shows that pods that have The texture is a bit rough, the size of the pods is bigger and the flesh of the pods tends to shrink. Quality texture pod can influence interest consumer, especially when long beans are to be harvested fresh for consumption. Long beans are widely used on a household scale where most consumers will choose peanut long Which fine when touched. Things This in accordance with study

Soetiarso and Marpaung (1996) stated that consumer preferences in selecting long beans are medium pod length between 40-60 cm, medium pod maturity, smooth, shiny surface and sweet pod taste.

4.3.3. Form seed

Form seed is Wrong One character qualitative Which observed on promising lines and long bean plant parents. The results of the analysis of long bean seed shape parameters can be seen in Table 6 and Illustration 12.

Table 6. Form Seed Plant Long beans

		Age Harvest (HSA)									
		8	11	14	17	20	23	26	29	32	35
Line of Hope	FA 1–1–4–3–6–8–B	l	l	g	g	g	g	g	g	g	g
	FS 3–4–7–1–B	l	l	g	g	g	g	g	g	g	g
	FA 3–2–13–14–B	l	l	g	g	g	g	g	g	g	g
	FA 1–1–5–3–18–B	l	l	g	g	g	g	g	g	g	g
	FA 1–1–10–1–6	l	l	g	g	g	g	g	g	g	g
	FS 3–4–10–3–B	l	l	g	g	g	g	g	g	g	g
	FS 3–4–8–2–B	l	l	g	g	g	g	g	g	g	g
Variety Comparator	Fagiola IPB	l	l	g	g	g	g	g	g	g	g
	Green Aura	l	l	l	l	l	l	l	l	l	l

Form seed l = (oval) And g = (kidney)

Based on Table 6, it can be seen that the seed shape produced by the 7 long bean lines is similar to the IPB Fagiola parent, namely kidney-shaped, while the Green Aura parent produces oval-shaped seeds. hope line And Elder Fagiola IPB harvested on harvest age 8 and 11 HSA results seed shape oval while the age of 14 to 35 HSA produces seed shape kidney. Seed shape kidney is a seed form that is often found in long beans. According to Widyawan *et al* . (2021) stated that peanut long Which Lots found in Indonesia own

variation type growth plant entangled seed shaped like kidney, round, long, or curved.

(Oval)

(Kidney)

Illustration 12. Differences Form Bean Seeds Long

Based on Illustration 12. It can be seen that in the promising lines, the oval-shaped seeds were obtained. on the seeds who are still young and just at the stage initiation seed. Development seed peanut long will follow increasing age from plant peanut long. Matter This in accordance with statement Sanhewe and Ellis (1996) who stated that during development seed, happen accumulation of food reserves in the cotyledons which causes changes in seed shape.

4.3.4. Color pod

The pod color characteristics of the promising lines and comparison varieties showed different results at certain harvest ages. The results of the long bean pod color analysis can be seen in Table 7. Based on Table 7, it can be seen that that color the pods produced elders Aura Different green with 7 strains peanut long. Color Which produced by 7 strain peanut long has similarities with the IPB Fagiola elder which is still in the same color group.

Table 7. Color Pod Line Hope And Variety Comparator on A number of Harvest Age .

		Age Harvest (HSA)									
		8	11	14	17	20	23	26	29	32	35
		(RHS)									
Line	G1	N77A	N77A	187B	187C	187B	200B	200B	200A	200C	200C
Hope	G2	N77A	N77A	187B	187B	187B	200B	200B	200A	200C	200C
	G3	N77A	N77A	187B	187B	187A	200A	200A	200A	200C	200C
	G4	N77A	N77A	187A	187B	187B	200B	200B	200A	200C	200C
	G5	N77A	N77A	187B	187B	187B	200B	200A	200A	200C	200C
	G6	N77A	N77A	187B	187A	187B	200B	200A	200A	200C	200C
	G7	N77A	N77A	187B	187B	187B	200D	200B	200A	200A	200C
Comparison	G8	N187A	187A	187A	187A	187A	200B	200B	200A	200B	200C
Varieties	G9	137B	138B	143B	143C	10C	10B	N199D	N199B	N199B	N199B

Code strain G1 = FA 1–1–4–3–6–8–B ; G2 = FS 3–4–7–1–B ; G3 = FA 3–2–13–14–B ; G4 = FA 1–1–5–3–18–B ; G5 = FA 1–1–10–1–6 ; G6 = FS 3–4–10–3–B ; G7 = FS 3–4–8–2–B ; G8 = Fagiola IPB and G9 = Aura Green.

Based on Table 7. can known that color pod on all over the strain that harvested age 8 And 11 HSA is color purplish (*purple group* RHS N77), harvest aged 14 to 20 DAP produces a color that tends to be red-purple (*greyed-purple group* RHS 187), while harvesting at 23 to 35 HSA produces brownish pods (*brown group* RHS 200). Long bean color pods purple signify existence anthocyanin on pod. Matter This according to research by Paramitha *et al.* (2018) which stated that the results of organoleptic tests on 15 strain hope peanut long selected Which pods Purple indicates that the darker the purple color produced by the pods, the higher the anthocyanin content. Harvesting at 23 to 35 days after planting produces brown pods because at this harvest age, the long bean pods enter physiological maturity. According to research by Mayun *et al* . (2021), long beans that have entered physiological maturity will experience a color change from green to yellow.

4.3.5. Color end pod

The pod tip color characteristics of the promising lines and comparison varieties have different results at certain harvest ages. The pod tip color can be seen in Table 8. Based on Table 8. can be known that Differences in harvest age resulted in different pod tip colors in promising long bean lines. Harvesting at 8 to 17 days after planting resulted in yellowish green pod tip colors in all promising lines and the Fagiola IPB parent (*yellow–green group* RHS 145).

Table 8. Color End Pod Line Hope And Variety Comparator on A number of Harvest Age .

		Age Harvest (HSA)									
		8	11	14	17	20	23	26	29	32	35
		(RHS)									
Line of Hope	G1	145A	145A	145C	145D	4C	200D	200A	200A	200C	200C
	G2	145A	145A	145A	145C	4D	200B	200A	200A	200C	200C
	G3	145A	145A	145C	145C	4D	200A	200A	200A	200C	200C
	G4	145A	145A	145C	145D	4D	200B	200A	200A	200C	200C
	G5	145A	145A	145A	145C	4D	162B	200A	200A	200C	200C
	G6	145A	145A	145C	145D	4C	200B	200A	200A	200C	200C
	G7	145A	145B	145C	145D	4C	162B	200B	200A	200A	200C
Comparison Varieties	G8	145C	145B	145B	145D	4D	200A	200B	200A	200B	200B
	G9	144A	146A	144B	143B	10C	10B	N199D	N199B	N199B	N199B

Code strain G1 = FA 1–1–4–3–6–8–B ; G2 = FS 3–4–7–1–B ; G3 = FA 3–2–13–14–B ; G4 = FA 1–1–5–3–18–B ; G5 = FA 1–1–10–1–6 ; G6 = FS 3–4–10–3–B ; G7 = FS 3–4–8–2–B ; G8 = Fagiola IPB And G9 = Aura Green.

Harvesting the whole hope line And The IPB Fagiola parent at the age of 20 HSA produced yellow pod tip color (*yellow group* RHS 4), while the green aura parent was also yellowish but in a different color group (*yellow group RHS 4).* RHS 10). Age harvest 23 until 35 HSA produce color end *brown* pods *group* RHS 200) on all over strain hope And elders Fagiola IPB, while the Green Aura parent is *brown group* N199D. it can be seen that the pods peanut the length harvested young have end green pods or yellow while those that have entered physiological maturity have brown pod tips. The pod tip color of the seven promising long bean lines was more similar to the Fagiola IPB parent. The pod tip color produced by the seven lines was in the same group as the Fagiola IPB parent in several treatments. age harvest. According to Syukur *et al.* (2018) state that Certain characters produced by plants are controlled only by simple genes .

4.3.6. Color seed main

The main seed color characteristics of the promising lines and comparison varieties have different results at certain harvest ages. The results of the analysis of the main seed color of long beans can be seen in Table 9. Based on Table 9, it can be seen that the promising lines have different colors at certain harvest ages. Harvesting all hope line And Elder Fagiola IPB and Green Aura at harvest age 8 DSA and 11 HSA produces the same color group, namely the yellow–green group (*yellow–green group* RHS 150).

Table 9. Color Seed Main Line of Hope And Variety Comparator on A number of Age Harvest.

		Age Harvest (HSA)									
		8	11	14	17	20	23	26	29	32	35
		(RHS)									
Line of Hope	G1	150A	150A	150C	4B	5D	4D	158B	161C	158A	161B
	G2	150A	150A	4C	4B	4C	4C	161A	161A	161A	161A
	G3	150A	145C	145C	N144A	N144A	164A	166B	166A	166A	166A
	G4	150A	150C	150C	63A	63A	166C	187A	187A	187A	187A
	G5	150A	150C	150C	4B	N144A	164A	164A	164A	166A	166A
	G6	150A	150C	N144A	4C	5D	4D	161B	160A	161C	162A
	G7	150C	150C	150C	63C	37B	166B	166B	166B	166A	166A
Comparison Varieties	G8	150A	150A	11B	67D	35D	24C	166B	166A	166A	166A
	G9	150C	150A	144D	150C	11C	158B	158C	161C	161D	164B

G1 = FA 1–1–4–3–6–8–B ; G2 = FS 3–4–7–1–B ; G3 = FA 3–2–13–14–B ; G4 = FA 1–1–5–3–18–B ; G5 = FA 1–1–10–1–6 ; G6 = FS 3–4–10–3–B ; G7 = FS 3–4–8–2–B ; G8 = Fagiola IPB And G9 = Aura Green.

Harvesting hope line at the age of 14 until 23 HSA own The main seed color is yellow, while harvesting at 26 to 35 HSA produces several color groups, namely gray-yellow (*greyed-yellow group* RHS 161 and RHS 162), gray-orange (*greyed-orange group* RHS 166), yellow-white (*yellow–white group* RHS 158) and gray–purple (*greyed–purple group* RHS 187). Long bean seeds harvested in the cooking phase fresh has the color that tend to bright and yellowish, while those harvested at the physiological ripeness phase tend to be more dark And brownish. Seed peanut long generally consists of from color main and secondary colors. The primary color of the seed is dominant color and striking and visible throughout the seed coat, while secondary colors are colors that are limited to certain parts. The secondary color is fainter and acts as an additional pattern on the seed coat (ISTA, 2007). The IPB Fagiola elder only has color primary (Description varieties Fagiola IPB) whereas elders aura Green has primary and secondary seed colors in a ratio of 70:30 (Description of the Green Aura variety).

Illustration 13. Seed Peanut Long Which Damaged And Rotten

Based on Illustration 13, it can be seen that when harvesting in the physiological maturity phase, it produces seed Which not enough optimal because of the season Rain excessive so that cause Lots seed Which rotten And difficult detected

This condition occurs during harvests between 26 and 35 days after planting. Excessive rainfall also causes many seeds to germinate within the pods, affecting quantitative parameters such as pod fresh weight, seed weight and number, germination capacity, and seed moisture content. Which has germinate in the pod can lower quality seed harvest results. According to Copeland and Mc Donald (2012), it is stated that the occurrence of decline accuracy in evaluation Power sprouts on seed Which has germinated in the pod because it has started growth metabolism, so it is no longer in a dormant or physiologically intact condition as a seed.

4.3.7. Color secondary seeds

The secondary seed color characteristics of the promising lines and comparison varieties showed different results at certain harvest ages. The results of the secondary seed color analysis of long beans can be seen in Table 1. 10. Based on Table 10, it can be seen that all promising long bean lines have secondary seed color. so that different with elders fagiola IPB Which No own color secondary seeds. Color seed secondary on all strain hope Not yet appear moment young pods. FA line 1–1–4–3–6–8–B has secondary seed color starting from harvest 17 HSA, strain FS 3–4–7–1–B, FA 1–1–5–3–18–B and FS 3–4–10–3–B own color color seed secondary start from 14 HSA, temporary strain others have secondary seed color at harvest starting from 11 HSA.

Table 10. Color Seed Secondary Line of Hope And Variety Comparator on A number of Harvest Age .

		Age Harvest (HSA)									
		8	11	14	17	20	23	26	29	32	35
		(RHS)									
Line of Hope	G1	No There is	No There is	n't any	24D	37B	166B	166B	166A	166A	166A
	G2	No There is	No There is	34D	34D	34D	164A	166B	166A	166A	166A
	G3	No There is	63B	63B	63C	63C	175A	187A	187A	187A	187A
	G4	No There is	No There is	No There is	24D	24D	161C	166B	166A	166A	166A
	G5	No There is	63A	63A	63C	63C	175A	175A	166A	166C	166A
	G6	No There is	n't any	67D	24C	37B	164A	166B	166A	166A	166A
	G7	No There is	n't any	n't any	150D	5D	158B	161C	161C	161A	161A
Comparison Varieties	G8	No There is	No There is	n't any	No There is	No There is	n't any	n't any	No There is	No There is	No There is
	G9	No There is	No There is	n't any	19C	24D	166D	166C	166B	166B	166B

Code strain G1 = FA 1–1–4–3–6–8–B ; G2 = FS 3–4–7–1–B ; G3 = FA 3–2–13–14–B ; G4 = FA 1–1–5–3–18–B ; G5 = FA 1–1–10–1–6 ; G6 = FS 3–4–10–3–B ; G7 = FS 3–4–8–2–B ; G8 = Fagiola IPB And G9 = Aura Green.

Differences in harvest age result in differences in the resulting bean color. Harvesting at an older age typically results in a brownish secondary bean color. Seed Which harvested when the pods Still young, tend own Greenish to yellowish color. According to Dio *et al* . (2023), mature long bean seeds vary, namely white, yellow, brown, reddish yellow, black and red spots. All lines have secondary colors like the Green Aura parent, but the ratio of the composition of the primary color And secondary Which different. Proportion color seed main And seed secondary in long beans can be seen in Illustration 14.


Chocolate: White (30:70)


Chocolate: White (50:50)


Dark: Bright (80:20)


Chocolate: White (80:20)


Seed Fagiola IPB

Illustration 14. Proportion Color Seed Main And Seed Secondary Long beans

Based on Illustration 14. can be known that there is a difference the proportion of secondary colors produced by the long bean hope strain with the green aura parent. The green Aura parent has a brown:white proportion of 30:70, while FA strain 1–1–4–3–6–8–B, FS 3–4–7–1–B And FS 3–4–10–3–B has the proportion chocolate: white as big as 50:50. Line FA 3–2–13–14–B And FA 1–1–10–1–6

has a dark:light color ratio of 80:20, while the FA strain 1–1–5– 3–18–B And FS 3–4–8–2–B own proportion chocolate: white as big as 80:20. Matter this is appropriate with study Shintawati *et al.* (2022) Which state varieties Fagiola IPB produces brown seeds while Green Aura is brown-white with white dominance, the brown-white color is divided into two, namely dominant chocolate with white tip, and mixture balanced chocolate-white.

4.2. Character Quantitative

4.2.1. Recapitulation results analysis variety on character quantitative

The observed quantitative characteristics consist of several growth and production parameters. The results of the analysis of variance on these quantitative parameters can seen on Table 11 And Table 12. Based on results analysis fingerprint on quantitative characters shows that the strain has an effect significantly on the parameters of pod length, fresh pod weight/plant, number of pods/plant, seed weight/pod, water content and sweetness level. Harvest age has an effect significant towards all parameters. Interaction between strains and harvest age has a significant effect on the fresh weight of pods/plant, number of pods/plant, germination capacity, and sweetness level. Interaction The relationship between strain and harvest age has a significant effect on the parameters of the number of pods per plant, sweetness level and germination power.

Table 11. Recapitulation Results Variety Fingerprint Character Quantitative Influence Single Line And Age Harvest.

No	Parameter	Line									F– count	Age Harvest (HSA)										
		G1	G2	G3	G4	G5	G6	G7	G8	G9		8	11	14	17	20	23	26	29	32	35	
1	Long pod (cm)	bc	b	d	e	CD	b	c	e	a	(*)	f	bc	a	a	a	b	b	CD	of	e	(*)
2	Weight pod fresh/plants (g)										(ns)	d	b	a	a	b	c	c	d	e	f	(*)
3	Amount pod/ plant (fruit)	ab	bc	ab	a B C	a	a B C	a	a	c	(*)	d	d	d	d	d	c	c	ab	a	ab	(*)
4	Age save pod fresh (hsp)										(ns)	a	b	b	c	d	e	f	f	f	f	(*)
5	Sweetness level (brix)	bc	ab	ab	ab	ab	ab	ab	c	a	(*)	b	a	b	c	d	e	f	f	f	f	(*)
6	Weight seeds/pods (g)	CD	d	ab	a B C	a	CD	bcd	a B C	CD	(*)	e	d	b	ab	a	b	b	c	d	d	(*)
7	Number of seeds/pods (item)										(ns)	a	a	a	ab	a	a	ab	b	ab	ab	(*)
8	Level water seed (%)										(ns)	a	b	c	d	e	f	f	f	f	f	(*)
9	Power germinate (%)										(ns)	e	e	CD	b	a	a	b	bc	d	e	(*)

Notation * = significant (f – hit > f table); ns = No significant (f – hit < f table); G1 = FA 1–1–4–3–6–8–B ; G2 = FS 3–4–7–1–B ; G3 = FA 3–2–13–14–B ; G4 = FA 1–1–5–3–18–B ; G5 = FA 1–1–10–1–6 ; G6 = FS 3–4–10–3–B ; G7 = FS 3–4–8–2–B ; G8 = Fagiola IPB and G9 = Aura Hijau.

Table 12. Recapitulation Results Fingerprint Variety Character Quantitative The Effect of Interaction Line with Age Harvest.

No	Parameter	F-count Interaction								
		G1xP	G2xP	G3xP	G4xP	G5xP	G6xP	G7xP	G8xP	G9xP
1	Long pod (cm)					(ns)				
2	Weight pod fresh/plants (g)					(ns)				
3	Amount pods/plants (fruit)	*(bc;bc;bc;bc;c;ab;ab;a;a;abc)	*(b;b;b;b;b;b;b;a;a;ab)	*(c;abc;abc;bc;bc;abc;ab;a;ab;bc)	*(b;b;b;ab;ab;ab;ab;b;a A)	*(cd;d;bcd;abcd;abcd;abcd;abc;a;a;ab)	*(c;c;bc;bc;c;bc;abc;a;ab;ab)	*(bc;c;bc;ab;bc;a;ab;a;a A)	*(c;bc;abc;bc;bc;ab;a;a;a;a)	*(b;ab;b;b;b;b;b;ab;a;ab)
4	Age store fresh pods (hsp)					(ns)				
5	Sweetness level (brix)	*(ab;a;b;c;cd;de;e;e;e;e)	*(b;a;ab;bc;bc;c;d;d;d;d)	*(bc;a;ab;bc;cd;de;e;e;e;e)	*(a;a;ab;bc;cd;de;e;e;e;e)	*(bc;a;ab;bc;cd;de;e;e;e;e)	*(b;a;b;bc;c;c;d;d;d;d)	*(ab;a;bc;c;c;d;d;d;d)	*(bc;a;a;ab;bc;cd;de;e;e;e;e)	*(a;a;a;bc;b;b;c;c;c;c)
6	Weight seeds/pods (g)					(ns)				
7	Number of seeds/pods (item)					(ns)				
8	Level water seed (%)					(ns)				
9	Germination power (%)	*(c;c;bc;ab;a;ab;ab;bc;c;c)	*(d;d;cd;abc;ab;a;bcd;d;d;d)	*(b;c;ab;ab;a;a;a;bc;c)	*(c;c;bc;bc;ab;a;a;abc;abc;c)	*(c;c;bc;ab;a;ab;bc;ab;ab;c)	*(c;c;bc;abc;a;ab;bc;c;c;c)	*(c;c;ab;ab;a;ab;bc;abc;abc;bc)	*(c;c;ab;ab;a;a;a;ab;ab;bc)	*(c;c;c;ab;ab;ab;a;ab;bc;c)

Notation * = significant (f – hit > f table); ns = No significant (f – hit < f table); G1 = FA 1–1–4–3–6–8–B ; G2 = FS 3–4–7–1–B ; G3 = FA 3–2–13–14–B ; G4 = FA 1–1–5–3–18–B ; G5 = FA 1–1–10–1–6 ; G6 = FS 3–4–10–3–B ; G7 = FS 3–4–8–2–B ; G8 = Fagiola IPB; G9 = Green Aura and P = (8 HSA; 11 HSA; 14 HSA; 17 HSA; 20 HSA; 23 HSA; 26 HSA; 29 HSA; 32 HSA; 35 HSA).

4.2.2. Characteristic peanut long For determination harvest fresh

4.2.2.1. Long pod

The results of the analysis of variance show that the strain has a significant effect on age. harvest on parameter long pod. Data results analysis presented on Table

13. Based on Table 13, it can be seen that the FS 3–4–7–1–B, FS 3–4– 10–3–B, FA 1–1–4–3–6–8–B, FA 3–2–13–14–B, FA 1–1–10–1–6 and FS 3–4–8–

2–B is a line with a pod length that exceeds the IPB fagiola parent. The pod length is better compared to with elders can be caused by the effects of heterosis and heterobeltiosis which increase superior traits in offspring furthermore. Matter This very relevant in effort creation varieties new in plant breeding. According to Wijaya *et al.* (2013) stated that heterosis And heterobeltiosis increase can influenced by involvement many genes in various yield characters. All lines were harvested at 14, 17, and 20 days old after anthesis (HSA) own long pod longest And different significantly with other treatments, meanwhile the 8 HSA treatment is a treatment that produce long pod shortest from all treatment. According to Fahmi *et al.* (2022) stated that quantitative traits such as pod length in plants peanut long Lots influenced by factor environment. Treatment 14, 17, and 20 HSA produce the longest pods because at this stage the long bean plants enter the fresh ripening phase.

Table 13. Results Test Carry on Different Real Honest Length Parameter Pod.

		Age Harvest (HSA)										Aver
		8	11	14	17	20	23	26	29	32	35	age
		(cm)										
Line of Hope	FA 1–1–4–3–6–8–B	45.69	60.67	68.33	69.00	68.43	63.21	62.06	58.69	53.19	51.94	60.12 [c]
	FS 3– 4– 7– 1– B	41.36	56.75	68.16	70.20	71.51	67.73	65.24	62.90	61.55	58.29	62.37 [b]
	FA 3– 2– 13– 14– B	40.02	58.13	64.13	63.33	61.04	59.51	57.49	55.06	48.65	47.97	55.54 [d]
	FA 1–1–5–3–18–B	40.86	56.42	60.46	60.53	56.06	51.19	51.80	51.63	49.26	44.12	52.23 [e]
	FA 1– 1– 10– 1– 6	50.39	60.58	65.56	65.49	61.36	58.60	57.77	53.66	51.16	49.37	57.39 [cd]
	FS 3– 4– 10– 3– B	45.70	62.03	69.49	72.54	69.19	61.88	66.85	56.97	58.34	56.26	61.92 [b]
	FS 3–4–8–2–B	43.52	59.41	64.99	67.45	61.68	61.16	62.25	59.28	55.32	55.89	59.09 [c]
Variety Comparator	Fagiola IPB	40.88	50.04	56.71	55.80	54.40	50.90	47.19	48.17	47.83	44.05	49.60 [e]
	Green Aura	49.39	62.36	72.17	76.32	79.13	71.97	73.52	64.83	59.89	57.92	66.75 [a]
Average		44.20 [f]	58.49 [bc]	65.56 [a]	66.74 [a]	64.76 [a]	60.68 [b]	60.46 [b]	56.80 [cd]	53.91 [de]	51.76 [e]	

Superscript different on column And line Which The same show difference real (P<0.05).

4.2.2.2. Weight pod fresh per plant

The results of the analysis of variance indicate that there are significant differences in the parameters of fresh pod weight per plant based on harvest age treatment. Data on differences in lines and harvest age are presented in Table 14. Based on Table 14, it is known that that all over strain hope peanut long produce weight highest pod on age harvest 14 And 17 HSA Which different very real with Harvest age 35 HSA. Fresh pod weight at 23 HSA decreased until harvest age 35 HSA because at that harvest age the pods had begun to dry out, making them lighter in weight. Harvest ages 14 and 17 HSA produced highest pod weight because at harvest time This is the optimal age used for harvesting for consumption. This is in accordance with the statement Fahmi *et al.* (2022) Which state that pod young Which harvested in about 15 days After flowering, it can produce maximum pod weight with optimal pod size, the seeds inside the pod do not look prominent and are also easy to break.

Pod weight characteristics can also be influenced by a combination of genetic and environmental factors, where genetic variation provides the potential and a supportive environment can significantly increase pod yield. This is consistent with research by Zulfarosda *et al. (2020), who stated that superior varieties with high yield potential can maximize the interaction between genetic and environmental factors, thus enabling* optimal plant growth .

Table 14. Results Test Carry on Different Real Honest Weight Parameters Pod Fresh per Plant.

		Age Harvest (HSA)										Aver
		8	11	14	17	20	23	26	29	32	35	age
		(g)										
Line of Hope	FA 1–1–4–3–6–8–B	20.89	67.22	99.22	64.56	58.67	24.78	35.67	26.56	11.44	9.33	41.83
	FS 3– 4– 7– 1– B	16.56	57.44	87.89	72.89	80.67	33.78	32.44	29.11	13.11	7.33	43.12
	FA 3– 2– 13– 14– B	20.11	88.78	109.33	105.11	64.56	38.78	42.33	21.56	14.33	12.67	51.76
	FA 1– 1– 5– 3– 18–B	26.89	58.33	74.89	74.11	56.22	32.00	31.44	22.78	11.67	8.44	39.68
	FA 1– 1– 10– 1– 6	25.67	59.11	110.56	102.78	73.89	33.67	43.00	24.89	19.56	12.00	50.51
	FS 3– 4– 10– 3– B	18.00	51.67	97.00	104.78	74.33	51.44	41.67	30.89	15.89	9.67	49.53
	FS 3–4–8–2–B	20.67	38.00	79.56	90.11	60.00	37.22	32.00	18.22	13.44	9.89	39.91
Variety Comparator	Fagiola IPB	26.89	58.22	90.56	68.67	50.11	36.78	36.56	25.78	16.78	10.67	42.10
	Aura Green	19.56	46.44	66.56	66.00	78.11	45.22	46.56	37.11	13.67	7.56	42.68
Average		21.69 ^{d}	58.36 ^{b}	90.62 ^{a}	83.22 ^{a}	66.28 ^{b}	37.07 ^{c}	37.96 ^{c}	26.32 ^{d}	14.43 ^{e}	9.73 ^{f}	

Superscript different on line Which The same show difference real (P<0.05).

4.2.2.3. Amount pod per plant

Results analysis variety show that there is interaction between treatment of differences in strains with harvest age on the parameter of the number of pods per plant. Data difference strain And age harvest served on Table 15. Based on Table 15. It can be seen that the interaction between the expected strain and the harvest age can produce amount pod Which tall. Line FA 1–1–4–3–6–8–B produce pods most on 23, 26, 29, 32 And 35 HSA, strain FS 3–4–7–1–B produce amount pod most on 29, 32 And 35 HSA, strain FA 3–2–13–14–B produced the highest number of pods at 11, 14, 23, 26, 29 and 32 HSA. The FA line 1–1–5–3–18–B produced the highest number of pods at 17, 20, 23, 26, 32 And 35 HSA temporary strain FA 1–1–10–1–6 on 17, 20, 23, 26, 29, 32 and 35 HSA. The FS 3–4–10–3–B strain produced the highest amount at 26, 29, 32 And 35 HSA, temporary strain FS 3–4–8–2–B produce amount pod most on 17, 23, 26, 29, 32, And 35 HSA.

The greatest number of pods is generally produced by a single age treatment. harvest on 29 HSA , 32 and 35 HSA where the conditions plant Already old and some pod Already dry up. Based on matter here it is although amount pods are abundant at that harvest age, fresh harvesting cannot be done because pod Already old. Harvesting fresh produce pod Which No too many Because existence difference plant sample Which used make The number of pods produced is less uniform. According to Tambunan *et al.* (2022), the number of pods produced on each plant is closely related to the number of flowers formed on that plant.

Table 15. Results Test Carry on Different Real Honest Parameter Amount Pod per Plant

		Age Harvest (HSA)										Aver
		8	11	14	17	20	23	26	29	32	35	age
		(Fruit)										
Line of Hope	FA 1–1–4–3–6–8–B	2.56 ^{bc}	2.67 ^{bc}	2.67 ^{bc}	2.44 ^{bc}	2.33 ^{c}	3.56 ^{ab}	3.56 ^{ab}	3.89 ^{a}	4.00 ^{a}	3.22 ^{abc}	3.09 ^{a}
	FS 3–4–7–1–B	2.00 ^{b}	2.22 ^{b}	2.22 ^{b}	2.22 ^{b}	2.33 ^{b}	2.44 ^{b}	2.00 ^{b}	3.78 ^{a}	4.00 ^{a}	3.00 ^{ab}	2.62 ^{a}
	FA 3–2–13–14–B	2.33 ^{c}	3.11 ^{abc}	2.89 ^{abc}	2.78 ^{bc}	2.78 ^{bc}	3.22 ^{abc}	3.78 ^{ab}	4.00 ^{a}	3.67 ^{ab}	2.67 ^{bc}	3.12 ^{a}
	FA 1–1–5–3–18–B	2.33 ^{b}	2.22 ^{b}	2.33 ^{b}	2.67 ^{ab}	2.67 ^{ab}	3.00 ^{ab}	3.22 ^{ab}	2.44 ^{b}	3.78 ^{a}	3.78 ^{a}	2.84 ^{ab}
	FA 1–1–10–1–6	2.67 ^{cd}	2.56 ^{d}	2.78 ^{bcd}	2.89 ^{abcd}	2.89 ^{abcd}	3.44 ^{abcd}	3.78 ^{abc}	4.00 ^{a}	4.00 ^{a}	3.89 ^{ab}	3.29 ^{ab}
	FS 3–4–10–3–B	2.00 ^{c}	2.22 ^{c}	2.56 ^{bc}	2.56 ^{bc}	2.33 ^{c}	2.78 ^{bc}	3.11 ^{abc}	4.00 ^{a}	3.56 ^{ab}	3.67 ^{ab}	2.88 ^{abc}
	FS 3–4–8–2–B	2.56 ^{bc}	1.78 ^{c}	2.33 ^{bc}	3.00 ^{ab}	2.67 ^{bc}	3.89 ^{a}	3.44 ^{ab}	4.00 ^{a}	3.89 ^{a}	3.89 ^{a}	3.14 ^{abc}
Variety Comparator	Fagiola IPB	2.22 ^{c}	2.67 ^{bc}	2.89 ^{abc}	2.67 ^{bc}	2.67 ^{bc}	3.78 ^{ab}	4.00 ^{a}	4.00 ^{a}	4.00 ^{a}	3.89 ^{a}	3.28 ^{bc}
	Green Aura	2.44 ^{b}	2.67 ^{ab}	2.44 ^{b}	2.33 ^{b}	2.11 ^{b}	2.11 ^{b}	2.00 ^{b}	2.89 ^{ab}	3.67 ^{a}	2.89 ^{ab}	2.56 ^{c}
Average		2.35 ^{d}	2.46 ^{d}	2.57 ^{d}	2.62 ^{d}	2.53 ^{d}	3.14 ^{c}	3.21 ^{c}	3.67 ^{ab}	3.84 ^{a}	3.43 ^{bc}	

Superscript different on column, line And matrix interaction Which The same show difference real ($P<0.05$).

4.2.2.4. Age save pod fresh

The results of the analysis of variance showed that there were differences in the results of the harvest age treatment on the shelf life characteristics of fresh pods. Data on differences strain And age harvest served on Table 16. Based on Table 16. It can be seen that the best shelf life characteristics of pods in all the promising lines are on harvesting age 8 HSA different real with treatment 11 and 14 HSA. Pod Which Still young generally own age save pod the longest, while the pods that have old then the seeds are already dry, thus the seeds tend to have a longer shelf life. According to Kurdianingsih *et al.* (2015), higher water content in fruit is thought to lead to higher respiration and transpiration rates, thus affecting fruit storage.

Harvesting at 8 days after planting has the longest shelf life due to the pods' still dense texture and low water content, but they are firm enough to be consumed. This is why harvesting at 8 days after planting is not recommended for consumption, given the pods' immature texture and quality. maximum. Harvesting for consumption can be done at the age of 11 to 14 HSA Which own age save more long than treatment others. According to Aryawan And Ginting (2016) state that there is influence harvest time on the crispness of the pods, the higher the crispness value, the harder the texture of the pods and affects the sweetness level of the pods.

Table 16. Results Test Carry on Different Real Honest Parameters Shelf Life Pod Fresh

		Age Harvest (HSA)										Aver
		8	11	14	17	20	23	26	29	32	35	age
		(Day)										
Line of Hope	FA 1–1–4–3–6–8–B	8.00	6.00	6.00	3.00	2.00	1.00	0.00	0.00	0.00	0.00	2.60
	FS 3–4–7–1–B	9.00	7.00	6.00	3.00	2.00	1.00	0.00	0.00	0.00	0.00	2.80
	FA 3–2–13–14–B	9.00	6.00	6.00	3.00	2.00	1.00	0.00	0.00	0.00	0.00	2.70
	FA 1–1–5–3–18–B	8.00	6.00	6.00	3.00	2.00	1.00	0.00	0.00	0.00	0.00	2.60
	FA 1–1–10–1–6	8.00	7.00	6.00	3.00	2.00	1.00	0.00	0.00	0.00	0.00	2.70
	FS 3–4–10–3–B	8.00	6.00	6.00	3.00	2.00	1.00	0.00	0.00	0.00	0.00	2.60
	FS 3–4–8–2–B	8.00	6.00	6.00	3.00	2.00	1.00	0.00	0.00	0.00	0.00	2.60
Variety Comparator	Fagiola IPB	8.00	7.00	6.00	3.00	2.00	1.00	0.00	0.00	0.00	0.00	2.70
	Aura Green	8.00	6.00	6.00	3.00	2.00	1.00	0.00	0.00	0.00	0.00	2.60
Average		8.22 [a]	6.33 [b]	6.00 [b]	3.00 [c]	2.00 [d]	1.00 [e]	0.00 [f]	0.00 [f]	0.00 [f]	0.00 [f]	

Superscript different on line Which The same show difference real (P<0.05).

4.2.2.5. Level sweetness

The results of the analysis of variance indicate that there is an interaction between the treatment of different lines and harvest age on the parameter of pod sweetness level. Data on the differences in lines and harvest age are presented in Table 17. Based on Table 17, it can be seen that the FA line 1–1–4–3–6–8–B and FS 3–4–8–2–B have the highest sweetness levels at harvest age of 8 and 11 HSA. Lines FS 3–4–7–1– B, FA 3–2–13–14–B and FA 1–1–10–1–6 had the highest sweetness levels at harvest ages of 11 and 14 HSA. The FA 1–1–5–3–18–B line had the lowest sweetness levels. highest at harvest time 8, 11 And 14 HSA, while the FS 3–4– 10–3–B strain had the highest sweetness level at harvest age of 11 HSA. The comparison variety Fagiola IPB produced the highest sweetness level at harvest age. 11 And 14 HSA temporary elders Aura green produces highest level of sweetness on 8, 11 And 14 HSA. According to Tobiba *et al* . (2023) state that level sweetness (brix) Which produced on plant can varies depends on several factors, including the variety used, environmental conditions, and harvest time.

The sweetness level of long bean pods is a consumer consideration when selecting long beans. The Brix value of long bean pods Which colored red more low from pod Which colored green, This is due to the anthocyanin content in the pods. According to research by Ardian *et al.* (2016), the Brix content of red pods is lower due to the anthocyanin content in the pods, which makes the pods taste bitter.

Table 17. Results Test Carry on Different Real Honest Parameter Level Sweetness

		Age Harvest (HSA)										Flat-flat
		8	11	14	17	20	23	26	29	32	35	
		(Brix)										
Line of Hope	FA 1–1–4–3–6–8–B	2.89 ab	4.11 a	2.40 b	1.11 c	0.96 cd	0.22 de	0.00 e	0.00 e	0.00 e	0.00 e	1.18 bc
	FS 3–4–7–1–B	2.40 b	3.91 a	2.73 ab	1.80 bc	1.56 bc	0.82 c	0.00 d	0.00 d	0.00 d	0.00 d	1.24 ab
	FA 3–2–13–14–B	1.69 bc	4.11 a	2.93 ab	2.11 bc	1.01 cd	0.40 de	0.00 e	0.00 e	0.00 e	0.00 e	1.21 ab
	FA 1–1–5–3–18–B	3.71 a	2.98 a	2.71 ab	1.58 bc	1.31 cd	0.58 de	0.00 e	0.00 e	0.00 e	0.00 e	1.23 ab
	FA 1–1–10–1–6	2.07 bc	4.20 a	2.80 ab	1.62 bc	1.02 cd	0.49 de	0.00 e	0.00 e	0.00 e	0.00 e	1.21 ab
	FS 3–4–10–3–B	2.31 b	4.71 a	2.53 b	1.67 bc	0.87 c	0.76 c	0.00 d	0.00 d	0.00 d	0.00 d	1.22 ab
	FS 3–4–8–2–B	3.42 ab	3.97 a	2.47 bc	1.96 c	1.42 c	0.47 d	0.00 d	0.00 d	0.00 d	0.00 d	1.25 ab
Variety Comparator	Fagiola IPB	1.56 bc	3.07 a	2.20 ab	1.20 bc	0.91 cd	0.31 de	0.00 e	0.00 e	0.00 e	0.00 e	1.12 c
	Aura Green	4.13 a	4.49 a	4.16 a	1.44 bc	1.33 b	0.78 b	0.00 c	0.00 c	0.00 c	0.00 c	1.32 a
Average		2.68 b	3.95 a	2.77 b	1.61 c	1.15 d	0.54 e	0.00 f	0.00 f	0.00 f	0.00 f	

Superscript different on column, line And matrix interaction Which The same show difference real (P<0.05).

4.2.3. Characteristic peanut long For determination Cook

physiological 4.2.3.1.Seed weight per pod

The results of the analysis of variance showed that there were differences in the results of the strain treatment with the harvest age in the parameter of seed weight per pod. strain And age harvest served on Table 18. Based on Table 18. can be known that seed weight per pod of the hope strain Long beans are capable of exceeding the parent is the FA line 3–2–13–14–B, FA 1–1–5–3–18–B and FA 1–1–10– 1–6. Age harvest Which produce weight seed highest that is 17 And 20 HSA different very real with treatment 8 HSA, Because on age harvest 8 HSA seeds of size small And seed Still Lots filled water. Weight seed Which harvested age Young seeds are smaller in size, making them lighter in weight. According to Kristianti and Ashari (2020), the weight of a seed is influenced by the amount of food reserves it has; larger seeds have more abundant food reserves, and vice versa.

Seed weight is related to the size of the seeds produced at each harvest age. Larger seeds will increase seed weight. According to Yulyatin and Diratmaja (2015), seed size is an indicator of physical quality that influences seed storability and plant growth uniformity. Based on this, physiologically mature harvests can be carried out at 17 and 20 days after planting (HSA), because at these harvest ages, seed weight is at its peak and seed food reserves are still well-stored, supporting germination.

Table 18. Results Test Carry on Different Real Honest Weight Parameter Seed per pod .

		Age Harvest (HSA)										Aver
		8	11	14	17	20	23	26	29	32	35	age
		(g)										
Line of Hope	FA 1–1–4–3–6–8–B	0.57	2.52	6.29	5.65	7.89	2.73	5.57	3.84	2.07	2.17	3.93 ^{cd}
	FS 3–4–7–1–B	0.31	1.72	5.71	4.93	6.67	6.00	4.63	3.95	2.13	1.66	3.77 ^{d}
	FA 3–2–13–14–B	0.86	3.50	5.88	7.96	8.26	6.12	7.20	5.09	3.24	2.75	5.08 ^{ab}
	FA 1–1–5–3–18–B	0.87	4.37	6.81	7.61	6.96	4.76	5.52	3.62	2.95	1.95	4.54 ^{abc}
	FA 1–1–10–1–6	0.92	2.62	6.58	8.33	8.25	6.60	6.54	5.37	3.63	2.80	5.17 ^{a}
	FS 3–4–10–3–B	0.47	2.24	4.94	5.49	6.87	5.64	5.65	3.71	2.87	2.41	4.03 ^{bcd}
	FS 3–4–8–2–B	1.10	2.18	5.21	5.20	6.82	5.63	5.51	4.16	3.27	2.35	4.14 ^{abc}
Variety Comparator	Fagiola IPB	0.85	2.67	5.58	7.66	6.71	5.75	6.42	5.41	3.01	2.47	3.89 ^{CDs}
	Aura Green	0.68	1.12	3.66	5.49	6.56	6.08	5.50	4.73	2.80	2.30	3.89 ^{CDs}
Average		0.72 ^{e}	2.38 ^{d}	5.42 ^{b}	6.24 ^{ab}	7.21 ^{a}	5.52 ^{b}	5.74 ^{b}	4.36 ^{c}	2.86 ^{d}	2.30 ^{d}	

Superscript different on column And line Which The same show difference real (P<0.05).

4.2.3.2. Number of seeds per pod

The results of the analysis of variance show that there are differences in the results of the treatments. age harvest on parameter amount seed per pod. Based on Table

19. It can be seen that the highest number of seeds per pod was produced at harvests of 8, 11, 14, 17, 20, 23, 26, 32, and 35 HSA. The harvest age treatment produced the highest number of seeds except for the 29 HSA treatment which produced the lowest number of seeds of all treatments. The number of seeds formed will affect the number of seeds that can be produced.

The number of seeds in a long bean pod is also influenced by the length of the pod that can form. According to research Ardian *et al* . (2016) states that wider distances between seeds tend to produce a greater number of seeds. more A little. Amount seed Also influenced by weather. According to Kristianti and Ashari (2020) stated that when rainfall is high, sunlight is reduced, which results in photosynthesis not running perfectly and disrupting pod initiation, resulting in pods with wrinkled and small seeds, or even seedless pods.

4.2.3.4. Water content seed

The results of the analysis of variance show that there are differences in the results of the treatments. strain And age harvest on parameter level water seed. Data difference strains and harvest ages are presented in Table 20.

Table 19. Results Test Carry on Different Real Honest Parameters Amount Seed per pod .

		Age Harvest (HSA)										Aver age
		8	11	14	17	20	23	26	29	32	35	
		(Grain)										
Line of Hope	FA 1–1–4–3–6–8–B	20.33	17.67	21.00	17.00	21.00	15.33	19.33	14.00	16.00	17.67	17.93
	FS 3–4–7–1–B	16.67	20.00	21.33	17.33	18.33	19.67	15.33	16.33	14.67	16.00	17.57
	FA 3–2–13–14–B	21.33	19.33	20.00	19.67	20.00	21.00	18.67	18.33	19.33	20.00	19.77
	FA 1–1–5–3–18–B	20.33	16.33	21.33	20.33	19.67	18.33	21.00	17.00	18.33	19.67	19.23
	FA 1–1–10–1–6	19.67	20.33	19.33	20.67	20.00	22.67	18.00	17.33	20.00	20.00	19.80
	FS 3–4–10–3–B	18.00	19.67	20.67	18.33	19.33	17.67	16.00	16.00	21.00	17.67	18.43
	FS 3–4–8–2–B	21.00	22.00	18.67	15.67	19.67	20.33	18.33	17.00	18.67	18.00	18.93
Variety Comparator	Fagiola IPB	21.67	18.67	17.67	18.67	18.00	20.00	18.67	19.00	19.33	19.33	19.10
	Aura Green	19.00	21.33	20.33	19.00	17.67	20.00	17.33	15.33	19.67	18.33	18.80
Average		19.78 [a]	19.48 [a]	20.04 [a]	18.52 [ab]	19.30 [a]	19.44 [a]	18.07 [ab]	16.70 [b]	18.56 [ab]	18.52 [ab]	

Superscript different on line Which The same show difference significant (P<0.05).

Table 20. Results Test Carry on Different Real Honest Seed Moisture Content Parameters .

		Age Harvest (HSA)										Aver
		8	11	14	17	20	23	26	29	32	35	age
		(%)										
Line of Hope	FA 1–1–4–3–6–8–B	58.24	50.34	36.07	25.18	15.70	11.61	11.28	10.88	10.36	9.78	23.94
	FS 3–4–7–1–B	64.09	49.92	34.75	27.84	16.44	11.57	11.35	11.28	10.22	9.95	24.74
	FA 3–2–13–14–B	60.38	50.84	30.80	21.25	16.39	11.72	11.48	11.26	10.23	9.03	23.34
	FA 1–1–5–3–18–B	70.07	55.62	40.13	23.30	13.95	11.64	11.32	10.99	8.37	6.94	25.23
	FA 1–1–10–1–6	66.74	50.89	33.42	23.20	15.37	11.44	11.25	11.12	10.09	8.94	24.24
	FS 3–4–10–3–B	72.73	55.30	35.25	29.87	14.91	11.35	11.23	10.98	10.54	10.56	26.27
	FS 3–4–8–2–B	66.39	52.17	33.89	25.61	13.83	11.42	11.18	10.66	10.00	9.69	24.48
Variety Comparator	Fagiola IPB	71.28	56.99	38.63	26.49	13.45	11.23	10.53	10.08	9.67	9.28	25.76
	Aura Green	60.47	46.06	37.93	28.41	17.54	14.09	12.43	11.20	10.90	9.77	24.88
Average		65.60 [a]	52.02 [b]	35.65 [c]	26.05 [d]	15.29 [e]	11.78 [f]	11.34 [f]	10.94 [f]	10.04 [f]	9.33 [f]	

Superscript different on column And line Which The same show difference real (P<0.05).

Based on Table 20, it can be seen that all the promising lines and varieties comparison results level seed water highest on harvesting 8 HSA and level water seed lowest on age harvesting 23, 26, 29, 30 And 35 HSA. Water content decreases with increasing age of the plant due to the physiological activity of the pods towards the physiological maturity phase.

Treatment 23 HSA produce level water Which optimal For production The seed moisture content is 11.78%. According to Setiabudi *et al.* (2023), the water content of long bean seeds shows good results if it does not exceed 12%. If it exceeds this standard, the drying process needs to be repeated. Harvest age 26 HSA produces seed peanut long sprouts in the pod due to rainfall Which tall so that trigger decline quality seed. According to Christian research And Ashari (2020) state that rainfall Rain Which tall when production phase pods can increase water content in seeds and cause seeds germinate before planting which can cause the food reserves in the seeds to run out.

4.2.3.5.Germination power

Results analysis variety show that there is interaction between Treatment of differences in strains and harvest age on germination parameters. Data on differences in strains and harvest age are presented in Table 21.

Table 21. Results Test Carry on Different Real Honest Parameters Power Germinate.

		Age Harvest (HSA)										Aver age
		8	11	14	17	20	23	26	29	32	35	
		(%)										
Line of Hope	FA 1–1–4–3–6–8–B	0.00 ^{c}	0.00 ^{c}	23.33 ^{bc}	55.00 ^{ab}	73.33 ^{a}	66.67 ^{ab}	55.00 ^{ab}	21.67 ^{bc}	3.33 ^{c}	0.00 ^{c}	29.83
	FS 3–4–7–1–B	0.00 ^{d}	0.00 ^{d}	11.67 ^{cd}	43.33 ^{abc}	60.00 ^{ab}	61.67 ^{a}	16.67 ^{bcd}	5.00 ^{d}	1.67 ^{d}	0.00 ^{d}	20.00
	FA 3–2–13–14–B	0.00 ^{b}	0.00 ^{c}	28.33 ^{ab}	33.33 ^{ab}	63.33 ^{a}	55.00 ^{a}	51.67 ^{a}	53.33 ^{a}	8.33 ^{bc}	0.00 ^{c}	29.33
	FA 1–1–5–3–18–B	0.00 ^{c}	0.00 ^{c}	10.00 ^{bc}	10.00 ^{bc}	45.00 ^{ab}	48.33 ^{a}	51.67 ^{a}	25.00 ^{abc}	28.33 ^{abc}	0.00 ^{c}	21.83
	FA 1–1–10–1–6	0.00 ^{c}	0.00 ^{c}	11.67 ^{bc}	40.00 ^{ab}	63.33 ^{a}	41.67 ^{ab}	13.33 ^{bc}	40.00 ^{ab}	38.33 ^{ab}	3.33 ^{c}	25.17
	FS 3–4–10–3–B	0.00 ^{c}	1.67 ^{c}	15.00 ^{bc}	21.67 ^{abc}	66.67 ^{a}	51.67 ^{ab}	15.00 ^{bc}	8.33 ^{c}	5.00 ^{c}	0.00 ^{c}	18.50
	FS 3–4–8–2–B	0.00 ^{c}	0.00 ^{c}	28.33 ^{ab}	31.67 ^{ab}	66.67 ^{a}	50.00 ^{ab}	25.00 ^{bc}	25.00 ^{abc}	25.00 ^{abc}	11.67 ^{bc}	26.33
Variety	Fagiola IPB	0.00 ^{c}	0.00 ^{c}	23.33 ^{ab}	55.00 ^{ab}	73.33 ^{a}	66.67 ^{a}	55.00 ^{a}	31.67 ^{ab}	30.00 ^{ab}	6.67 ^{bc}	30.00
Comparator	Aura Green	0.00 ^{c}	0.00 ^{c}	11.67 ^{c}	43.33 ^{ab}	60.00 ^{ab}	61.67 ^{ab}	55.00 ^{a}	50.00 ^{ab}	13.33 ^{bc}	0.00 ^{c}	25.67
Average		0.00 ^{e}	0.19 ^{e}	18.52 ^{cd}	34.44 ^{b}	59.81 ^{a}	53.33 ^{a}	37.22 ^{b}	28.89 ^{bc}	17.04 ^{d}	2.41 ^{e}	

Superscript different on column, line And matrix interaction Which The same show difference real ($P<0.05$).

Based on Table 21, it can be seen that the interaction between all the expected lines with age harvest 20 And 23 HSA produce Power germinate which is high and the same as its parent. The FA 1–1–4–3–6–8–B line has the highest germination power at harvest ages of 17, 20, 23 and 26. The FS 3–4–7–1–B line and FS 3–4–10–3–B own Power germinate Which tall on age harvest 17, 20 and 23 HSA. FA strain 3–2–13–14–B has the highest germination power in age harvest 14, 17, 20, 23, And 29 HSA. Line FA 1–1–5–3–18–B produced the best germination power in the treatments 20, 23, 26, 29 and 32 HSA . Line FA 1–1–10–1–6 own results Power germinate highest on harvest age 17, 20, 23, 29 And 32 HSA, temporary strain FS 3–4–8–2–B own Power germinate highest on age harvest 14, 17, 20, 23, 29 And 32 HSA, will but both lines experienced a decrease in yield at harvest age 26 HSA.

The highest germination rate was achieved by all lines at harvest times of 20 and 23 days after planting (DAA) because long bean plants have reached physiological maturity at these harvest times. Kristianti and Ashari (2020) stated that high seed germination is influenced by the availability of nutrient reserves in the seeds, which significantly supports the germination process. Size seed Also influence amount reserves food which are contained in the seed so that will influential to germination Seed germination capacity decreases at later harvest times because the seeds are overripe, which causes food reserves to be depleted. According to Mahsus *et al* . (2024), the seed germination process is very... influenced by level maturity seed, in where seed Which Not yet

ripe in a way physiological own reserves food Which Not yet sufficient to support the germination process.

The germination results obtained do not meet the germination standard, which requires a minimum of 80% seed germination according to the Ministry of Agriculture. (2016) state that standard seed quality own Power Germination > 80%. The germination power of the seeds is not optimal, because the quality of the seeds decreases due to environmental conditions, which causes many seeds to germinate before harvesting. According to Lasopo *et al* . (2024), seed damage can be caused by the high water content in the seeds, which can trigger deterioration. seeds. Value Power germinate on seed results harvesting directly lower because the seeds experience an *after ripening phase* . This also occurs in study Silaban *et al* . (2021) Which state that seed peanut The length tested for growth simultaneity experienced lower results where simultaneity of less than 40% indicated that the seed group had less vigor, thought to be because the seeds used experienced dormancy *after ripening.*

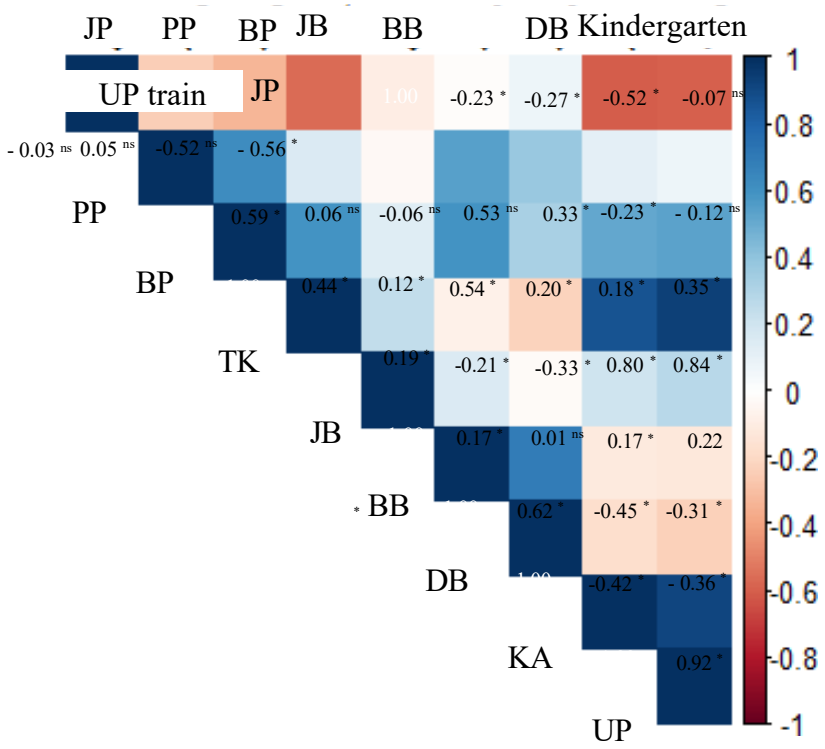
4.3. Discussion General

The results showed that the strain significantly influenced the parameters of pod length, number of pods per plant, seed weight per pod, and sweetness level. Harvest age significantly influenced all parameters. between strain And age harvest influential significant to amount

pods/plants, germination rate, and sweetness level. To determine the relationship between these parameters and achieve optimal fresh harvest and physiological maturity, additional analyses are required. These analyses include correlation and path analysis.

Path analysis was conducted on parameters that support the determination of fresh harvest age and physiological maturity age. need determine variables bound And variables free Which become basis for drawing conclusions. Based on the criteria for fresh ripe harvests, it can be seen that the indicators of long bean pods that can be harvested fresh can be characterized through character level sweetness pods.By Because That chosen sweetness level as the dependent variable and several fresh ripeness parameters as independent variables. Determining physiological ripeness is related to seed production, where criteria harvest Cook physiological notice parameter like level water, germination power And amount seed per pods. Based on matter here it is then the dependent variable chosen is the seed water content.

Based on correlation analysis which has done, the value obtained correlation between parameter. Mark coefficient correlation between parameter can seen on Illustration 15.



PP = long pod; BP = weight fresh pods/plantsJP = amount pods/plants; JB = number of seeds/pod; BB = weight of seeds/pod; TK = sweetness level; KA = seed water content; DB = germination power; UP = age save pod fresh; *(significant P<0.05); ns (no significant P>0.05).

Illustration 15. Matrix Correlation Between Quantitative Parameters

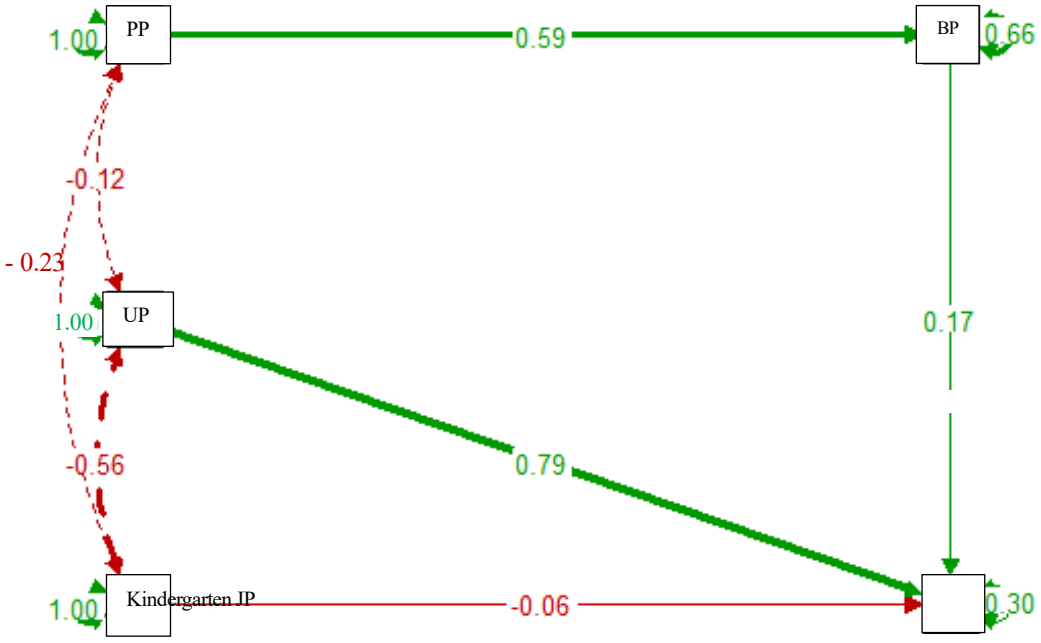
Based on Illustration 15, it can be seen that the sweetness level of pods has a significant positive correlation with the parameters of fresh pod weight/plant, number of seeds/pod, shelf life of fresh pods, and seed moisture content. A significant negative correlation with the sweetness level parameter is shown by the parameters of number of pods/plant, seed weight/pod, and germination capacity. A positive correlation can be interpreted as meaning that an increase in the parameter results will be followed by an increase in the positively correlated characters. According to Togatorop *et al.* (2021), a positive correlation reflects a unidirectional relationship, where an increase in one character will be followed by another character.

A very strong one-way relationship is shown by the character of the sweetness level. with age save pod fresh. Level sweetness And age The shelf life of the pods is positively correlated, meaning the sweeter the pods, the longer the shelf life. will the more long. Matter This in accordance with study Ashadi *et al.* (2021) which states that changes in reducing sugar levels will follow respiration patterns. fruit Where on fruit Which classified as climacteric, his respiration increased on beginning storage And after That show trend Which decreases with the length of storage. The shelf life of fresh pods is correlated positive by pod/plant weight and the number of seeds/pods. According to research by Dwiputra *et al* . (2015), seed production is positively correlated with the number of pods, and the number of pods is correlated with plant height.

Seed moisture content had a significant positive correlation with the parameters of fresh pod/plant weight, sweetness level, number of seeds/pod and shelf life of fresh pods, while a significant negative correlation was shown by the parameters of pod length, seed/pod weight and germination capacity. Germination capacity was positively correlated with pod length, fresh pod/plant weight, amount pods/plants And weight seeds/pods, temporary negative correlation with the parameters of number of seeds/pod, shelf life of fresh pods, sweetness level And level water. Correlation opposite Which strong between germination power and water content show that if the water content increases then the germination power increases will decrease. Matter This in accordance with statement Rolin *et al.* (2024)

Which state that decline Power germinate caused by level water increasing and high temperatures.

Determining fresh ripeness and physiological ripeness for this promising red long bean line can see the relationship between parameters so that recommendations are obtained. harvest age on each appropriate hope line. To strengthen the results Which obtained, done analysis track so that known level interrelationships variables. Results analysis track For determination Cook fresh based on on significant correlation analysis results on several parameters. The results of the path analysis with sweetness level as the dependent variable can be seen in Illustration 16.



UP = age store pods fresh; BP=fresh weight of pod/plant; JP=amount pods/plants; PP = length of pod/plant and TK=sweetness level.

Illustration 16. Diagram Track Determining Parameters Harvest Fresh.

Based on Illustration 16, it can be seen that in determining the fresh harvest age of the long bean hope strain, you can look at the parameters that have mark coefficient positive And highest. Determination harvest age fresh to see

parameter Which relate positive with level sweetness. According to Soetiarso's research And Marpaung (1996) state that Wrong One preference consumers in election peanut long that is flavor sweet Which owned by pod long beans .

The results of the path analysis show that a one unit increase in sweetness level so will cause improvement as big as 0.79 unit age Pod storage, 0.17 units of fresh pod weight per plant, reducing the number of pods/plant by 0.06 units. The parameters of pod storage life and fresh pod weight per plant gave a positive contribution, while the number of pods gave a positive contribution. contribution negative. Shelf life pod the longest shown by harvesting on 8 HSA, Then Which No too different Far shown harvesting at 11 and 14 HSA. The highest pod weight was produced when the long bean line was harvested at 14 and 17 HSA, while pod weights that were not too different were produced at 11 and 20 HSA.

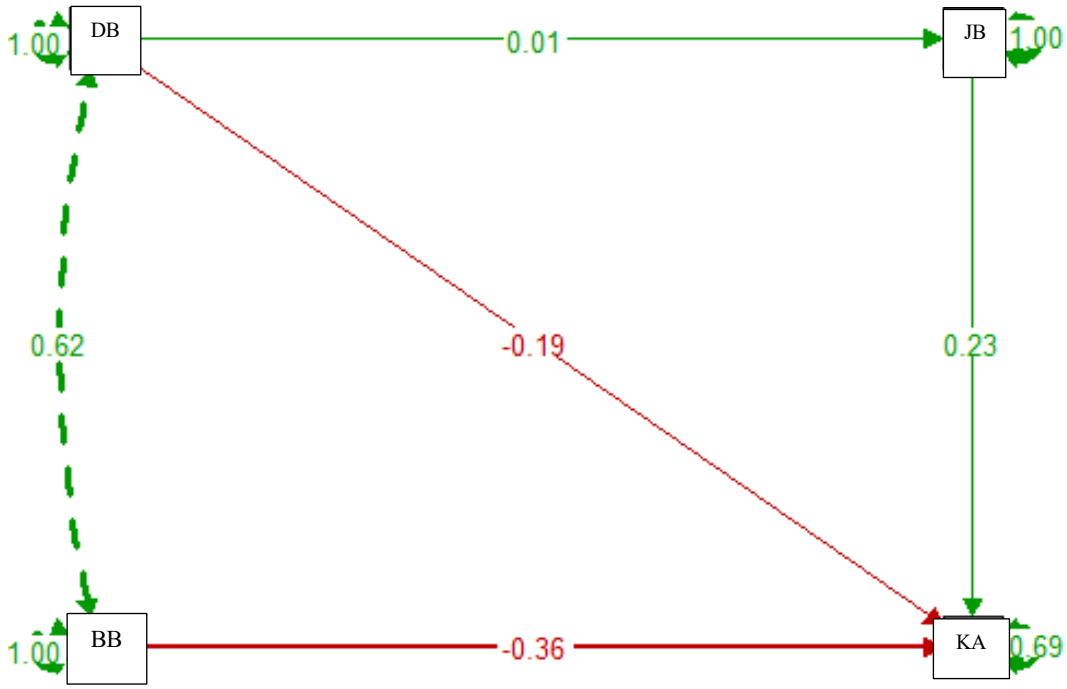
A small number of pods in the FA 1–1–4–3–6–8–B (G1) line was produced at harvesting 8 to 20 HSA, the FS 3–4–7–1–B (G2) and FS 3–4–10–3– B (G6) lines at 8 to 26 HSA, the FA 3–2–13–14–B (G3) and FA 1–1–10–1–6 (G5) on 8 until 23 HSA, strain FA 1–1–5–3–18–B (G4) on 8 until 29 HSA as well as FS 3–4–8–2–B (G7) on 8 until 14 HSA And 20 HSA. Temporary That, for the level sweetness pod highest on strain FA 1–1–4–3–6–8–B (G1) And FS 3– 4–8–2–B (G7) at harvest 8 and 11 HSA, FS line 3–4–7–1–B (G2), FA 3– 2–13–14–B (G3) And FA 1–1–10–1–6 (G5) on harvesting 11 And 14 HSA, strain

FA 1–1–5–3–18–B (G4) at harvest 8, 11 and 14 HSA, while the FS 3–4–10–3–B (G6) line at 11 HSA.

Based on the description, it can be obtained that the fresh harvest age for the FA 1–1–4–3–6–8–B (G1) and FS 3–4–8–2–B (G7) lines is at the harvest age 8 And 11 HSA, strain FS 3–4–7–1–B (G2), FA 3–2–13–14–B (G3) And FA 1–1–10–1–6 (G5) at harvest age of 11 and 14 HSA, FA line 1–1–5–3–18–B (G4) at 8, 11 And 14 HSA, as well as strain FS 3–4–10–3–B (G6) on age harvest 11 HSA. Determination age harvest this fresh see the value sweetness level Which high, long pod shelf life, high pod weight, not too many pods.

Determination harvest fresh Also see character qualitative Which produced like color pod, color end pod, form pod, texture pod, color main and secondary seed color, as well as seed shape. Based on this, harvesting at 8, 11, and 14 days after planting in several lines was chosen because it met the criteria for these qualitative characteristics. Young pods have a reddish-purple color. with color end the pods green, form And texture uniform, as well as the appropriate color and shape of the seeds.

Path analysis for determining physiological maturity is carried out on parameters such as the number of seeds/pods, seed/pod weight, water content and germination capacity. The parameters that are... made into as base determining physiological maturity, namely level seed water. The results of the path analysis can be seen in Illustration 17.



BB = weight seeds/pods; DB = Power germinate; JB = amount seeds/pods And KA = level water.

Illustration 17. Diagram Track Determining Parameters Harvest Physiological Cooking .

Based on Illustration 17, it can be seen that the determination of physiological maturity age uses the dependent variable, namely water content. The results of the path analysis show that if there is a one-unit increase in water content, it will increase the number of seeds/pod by 0.23 units, decrease germination by 0.19 units and 0.36 units of seed weight/pod. The number of seeds reflects the success of the flower formation and fertilization process, then the water content reflects the development phase or maturity of the seeds. This is what causes seeds with high water content to automatically be small in size, so that from the number of seeds per pod is more because competition for water and nutrients between seeds also increases. Pods with a small number of seeds result in supply water per seed more big, And seed can reach level water

lower faster, which means faster physiological maturation. According to research Rizkyma And Ariyanti (2023) state that cultivars Which Having high pollen productivity can benefit farmers because it is easy to produce, has a faster maturity rate, and produces large seeds, therefore the flowering phase can affect pod and seed production.

The number of seeds/pod parameter had a positive contribution, while germination capacity and seed/pod weight produced negative contributions. Based on this, the highest number of seeds was produced at all harvest ages except 29 HSA. Germination capacity in the FA 1–1–4–3–6–8–B (G1) line with results highest produced on age harvest 17 until 26 HSA, FS strain 3– 4–7–1–B (G2) and FS 3–4–10–3–B (G6) at 17 to 23 DSA, FA strain 3–2– 13–14–B (G3) at 14 to 29 DSA, FA strain 1–1–5–3–18–B (G4) at 20 to 32 HSA, as well as strain FA 1–1–10–1–6 (G5) And FS 3–4–8–2–B (G7) on 17, 20, 23, 29, and 32 HSA. The highest seed weight was produced by all lines at harvest ages of 17 and 20 HSA. Low water content was produced by all lines harvested at 23 to 26 HSA.

Based on description the, so age Cook physiological best For strains FA 1–1–4–3–6–8–B (G1), FA 3–2–13–14–B (G3) and FA 1–1–5–3–18–B (G4) are 20, 23, and 26 HSA. Line FS 3–4–7–1–B (G2), FA 1–1–10–1–6 (G5), FS 3–4–10–3–B (G6) And FS 3–4–8–2–B (G7) own age Cook physiological best at 20 and 23 HSA. This determination looks at the high number of seeds/pods, germination power Which height, weight of seeds/pods tall And water content low according to standards.

CHAPTER V

CONCLUSION AND SUGGESTION

5.1. Conclusion

The conclusion of this study is that the promising red long bean lines have different qualitative and quantitative characteristics at different harvest ages. Age harvest fresh on strain FA 1–1–4–3–6–8–B (G1) And FS 3–4–8–2– B (G7) is at harvest age 8 and 11 HSA, FS line 3–4–7–1–B (G2), FA 3–2–13–14–B (G3) And FA 1–1–10–1–6 (G5) on age harvest 11 And 14 HSA, strain FA 1–1–5–3–18–B (G4) on 8, 11 And 14 HSA, as well as strain FS 3–4–10–3–B (G6) at harvest age 11 HSA. Determining the fresh harvest age looks at the level value sweetness Which tall, age save pod Which long, weight pod high, the number of pods is not too many. The best physiological maturity age for the FA 1–1–4–3–6–8–B (G1), FA 3–2–13–14–B (G3) and FA 1–1–5–3–18–B lines (G4) is 20, 23, And 26 HSA. Line FS 3–4–7–1–B (G2), FA 1–1–10–1–
6 (G5), FS 3–4–10–3–B (G6) and FS 3–4–8–2–B (G7) have the best physiological maturity at 20 and 23 HSA. This determination looks at the number of seeds/pods that tall, Power germinate Which tall, weight seeds/pods Which tall And low water content according to standards.

5.2. Suggestion

The advice that can be given is that physiologically ripe harvests should not be carried out during the rainy season so that the quality of the seeds does not decrease.

LIST LIBRARY

Al–Furtusse, AK, Aldoghachi, KA, and Jabail, WA 2019. Response of three varieties of cowpea (*Vigna sinensis* L.) to different levels of potassium fertilizer under southern region conditions of Iraq. J. of Agricultural Sciences, 32, pp. 25–34. https://doi.org/10.37077/25200860. 2019. 254.

Ami, MS, and Candra, EA 2019. Identification of plants in traditional urap-urap dishes as material for compiling a plant taxonomy reference book. J. Education, Biology and Applied, 4(02), pp. 83–92. https://doi.org/10.33503/ebio.v4i02.256

Ardian, A., Aryawan, G., and Ginting, YC 2016. Evaluation of agronomic traits of several parental and hybrid genotypes of red-podded long bean (*Vigna sinensis* L.). J. Floratek, 11(1), pp.36–43. https://doi.org/10.21107/agrovigor.v9i1.1520

Arivudainambi, S., Vignesh, M., And Subramanian, N. 2020. Evaluation of cowpea (*Vigna unguiculata*) varieties for growth, yield, and nutrient content. *Agriculture & Horticulture Research* , 14(3): pp.221 – 229. https:/ /www.doi.org/10.22271/tpi

Aryawan, G., and Ginting, YC 2016. Evaluation of Agronomic Characters of Several Parental and Hybrid Genotypes of Red-Poded Long Bean (Vigna sinensis L.). J. Agrovigor, 9(1), pp.11–18. https://doi.org/ 10.21107/agrovigor.v9i1.1520

Ashadi, R., Syam, N., and Alimuddin, S. 2021. The effect of temperature and type of packaging on Power save And quality fruit tomato (*Solanum Lycopersicum* L.). Journal of Agricultural Sciences, 2(3), pp.19–28. https://doi.org/10.33096/agrotekmas.v2i3.209

Azka, N. A., and Sayekti, RS 2020. Characterization local long bean (*Vigna unguiculata subsp. sesquipedalis*) accession . J. Agrinova, 3(2), pp. 14–18. https://doi.org/10.22146/a.62709

Bakhtiar, I. F. 2020. Analysis diversity And newsability character agronomy F4 generation long beans resulting from a cross between three lines. *Thesis* . Diponegoro University .

BPS. Central Statistics Agency. 2023. *Sukolilo District in Figures 2023.* https://patikab.bps.go.id/id/publication/2023/09/26/df89a6db7413c5c6de8f5 7b7 /kecamatan–sukolilo–dalam–angka–2023.html (accessed date 10 March 2025).

Cahyaningrum, D. A., Yulianah, I., And Kuswanto. 2014. Interaction strain Environmental characteristics of promising lines of purple-podded long bean (*Vigna sesquipedalis* L. Fruwirth) in two locations. J. Crop Production, 2(1), ππ.404–411 . https://doi.org/10.21176/protan.v2i5.124

Choi, Y. M., Shin, M. J., Yoon, H., Lee, S., Yi, J., Wang, X., And Desta, K. T. 2024. Nutritional qualities, metabolite contents, and antioxidant capacities of yardlong beans (*Vigna unguiculata* subsp. sesquipedal) of different pod and seed colors. Antioxidants, 13(9), pp.1134. https://doi.org/ 10.3390/antiox13091134

Copeland, LO, and Mc Donald, MF 2012. Principles of seed science and technology. Springer Science & Business Media. https://link.springer.com/ book/10.1007/ 978-1-4615-1619-4.

Dio, AP 2023. Correlation and cross-analysis of yield traits of five varieties of long bean plants (*Vigna Sinensis*) in an organic environment. *Thesis* . University of Lampung.

Pusdataru Service. 2023. Pati Regency Rainfall Data for 2023. Public Works Service, Water Resources and Spatial Planning Data Source. https://pusdataru.jatengprov.go.id/portal_data/curah_hujan.

Directorate General Horticulture. 2024. Book Roof Horticulture 2023. Ministry of Agriculture. https://hortikultura.pertanian.go.id/wp-content/uploads/2024/04/buku_atap_2023 .

Directorate of Horticultural Seeds. 2012. Guidelines for Vegetable Seed Certification. Directorate General of Horticulture. https://adoc.pub/2012-tentang- panduan-teknis- Sertifikasi-benih-hortikultura.html.

Dwiputra, AH, Indradewa, D., and Putra, ETS 2015. The relationship between the components of the results And results three twelve cultivars soya bean (*Glycine max* (L.) Merr.). Vegetalica, 4(3), pp.14–28. https://doi.org/10.22146/veg.10474

Fahmi, S., Sugiono, D., Pirngadi, K., and Soedomo, P. 2022. Yield test of pras-1 line, new jaliteng variety, and 3 local cultivars of long bean (*Vigna Sesquipedalis* (L) Fruhw.) in Karawang district. J. Agricultural Sciences, 24(1), pp.13–20. https://doi.org/10.30595/agritech.v24i1.9102

Fitriana, I. N., Rajiman, R., And Yekti, A. 2022. Influence dose fertilizer pen cattle on the production and quality of long bean (*Vigna sinensis* L.) seeds. J. Agrotech Research, 3(2), pp.12–15. https://doi.org/10.36596/arj.v3i2.812

Haryanto, E., T. Suhartini, And E. Grace. 1999. Cultivation Peanut Long. Spreader Self-reliance.

Hastuti, NMD, Yulianah, I., and Saptadi, D. 2016. Heritability and genetic progress hope 7 family population F3 results cross chilli big (*Capsicum annuum* L.) TW 2 X PBC 473. J. Production Plants, 4(1), pp.63–72.

ISTA [International Rules for Seed Testing]. 2007. International Seed Testing Association, Bassersdorf, Switzerland. SUI. https://www.seedtest.org/en/publications/international-rules-seed-testing.html.

Kartono. 2004. Technique Storage Seed Soya bean Variety Willis on the level Water and Different Storage Temperatures. Agricultural Technology, 9, pp.79–82.

Ministry of Agriculture. 2016. Technical Guidelines for Food Crop Seed Certification (No. 1316/HK.150/C/12/2016 about Change On Decision Minister of Agriculture Number 355/HK.130/C/05/2015T). Ministry Agriculture, Jakarta.

Khan, M. M. H., M. Y. Rafii, S. I. Ramlee, M. Jusoh, and A. Mamun. 2020. Genetic Variability, Heritability, and Clustering Pattern Exploration of Bambara Groundnut (*Vigna subterranea* L.Verdc) Accessions for the Perfection of Yield and Yield–Related Traits. BiomedRes. Int. 2020: 2195797. doi:10.1155/2020/2195797.

Koryati, T., H. Ningsih., I. Erdiandini., M. Paulina., R. Firgiyanto., J. Junairiah., and VK Sari. 2022. Plant Breeding. Our Writing Foundation, Medan. https://sipora.polije.ac.id/22051.

Kristianti, II, and Ashari, S. 2020. The effect of various harvest ages of several varieties of long beans (*Vigna sinensis* L.) on seed viability during the growing season. Rain. J. Production Plant, 8(11), 375 – 380. https://doi.org/10.21776

Kurdianingsih, S., Rahayu, A., and Setyono, S. 2015. Effectiveness of liquid organic potassium fertilizer and stages of potassium fertilization on growth, production, And Power save peanut long (*Vigna sesquipedal* (L.) Fruhw.) cultivar KP–1. J. Agronida, 1(2), pp.92 – 105. https://doi.org/10.30997/jag.v1i2.177.

Kusmiyati, F., Anwar, S., And Herwibawa, B. 2021. Agronomic character evaluation of F3 yardlong bean progenies. AIP. Conference Proceedings, 2353, 1-4. https://doi.org/10.1063/5.0052844

Lasopo, R., Laode, B., and Wijayanti, D. 2024. Effect of soaking type on germination of red bean seeds (*Phaseolus vulgaris* . L.). J. Babasal Agromu, 2(1), pp.93–101. https://doi.org/10.32529/baj.v2i1.3332.

Lastriyanto A., B. D. Argo. And D. Aringtyas. 2016. Effect packaging vacuum on the quality of soybean seeds (*Glycine max* L.) of the Anjasmoro variety during storage. J. of Tropical Agricultural Engineering and Biosystems, 4(2), pp.87 – 93.

Latif, D. 2018. Estimate amount genes controller color purple on peanut long (*Vigna Sesquipedalis* L. Fruwirth) with purple pods. Thesis. Brawijaya University, Malang.

Mahjabin., Bilal, S., And Abidi, A. B. 2015. Physiological and biochemical changes during seed maturation of legumes: focus on nutrients content and seed quality. International Journal of Recent Scientific Research, 6(4), pp. 3416–3422. https://doi.org/10.24941/ijcr

Mahsus, RF A., Sulistiyono, NBE and Syaban, R. A. 2024. The effect of chicken manure and banana stem mollusks on the production and quality of green bean seeds (*Vigna radiata* L.). In Agropross: National Conference Proceedings of Agriculture (pp. 538–545). Jember State Polytechnic.

Mayun, I., Astiningsih, A. M., Sedana, I. W., And Raka, D. I. G. N. 2021. Determining harvest time for production Quality seeds of long bean plants (*Vigna sinensis* L.). J. on Agriculture Science, 11(1), pp.21-29 . https://doi.org/10.24843/AJoAS.2021.v11.i01.p03

Mlik, D., Ali, A., and Fajeriana, N. 2023. Peanut cultivation system in Kofalit Village, Salkma District, South Sorong Regency. J. Agriva, 1(1), pp.34-42 . https://doi.org/10.33506/agriva.v1i1.2100

Narendri, GO, Yulianah, I., and Kuswanto, K. 2017. Genetic purification of four varieties peanut long (*Vigna sesquipedal* (L.) Fruwirth) pods purple. J. Plantropica , 2(1), pp.1–9.

Ningsih, NNDR, Raka, IGN, Siadi, IK, and Wirya, GNAS 2018. Testing the quality of seeds of several types of horticultural plants circulating in Bali. J. Tropical Agroecotechnology, 7(1), ππ.64–72 . https://ojs.unud.ac.id/index.php/jat/article/view/38261

Nisa, C. 2022. Growth and yield response of long bean plants (*Vigna sinensis* L.) to the provision of various types of mulch. Thesis. Muhammadiyah University of Gresik.

Paramitha, AI, Damanhuri, D., and Kuswanto, K. 2018. Potential of promising lines of purple-podded long beans. J. Agricultural Sciences, 2(1), pp. 32-37 . https://doi.org/10.52166/agroteknologi.v2i1.1284 .

Pervaiz, T., Songtao, J., Faghihi, F., Haider, MS, and Fang, J. 2017. Naturally occurring anthocyanins, structure, functions and biosynthet ic pathway in fruit plants. J. Plant Biochem. Physiol, 5(2), pp.1 – 9. https://doi.org/10.4172/2329– 9029.1000187

Pradnyawati, N. K. D., Raka, I. G. N., And Siadi, I. K. 2019. Influence age harvest on the yield and quality of long bean seeds (*Vigna sinensis* L.). J. Tropical Agroecotechnology, 8(1), pp.53 – 61.

Priska, M., N. Peni., L. Carvallo., and YD Ngapa. 2018. Anthocyanins and their utilization. J. Cakra Kimia, 6(2), pp.79–97. https://ojs.unud.ac.id/ index.php/JAT/article/view/47886.

Center for Plant Variety Protection (PVTPP). (2024, November 29). Inspection Procedures Substantive Peanut Long (Presentation PowerPoint). PVTPP on talk ke-39.

PVT Center. 2014. Guidelines for Implementation of Tests (PPU) for Novelty, Uniqueness, Uniformity and Stability of Long Beans. Document number PVT/PPU/19/3. PVT Center. Jakarta.

Putri, FM, Ardian, A., and Sa'diyah, N. 2015. Quality Test of Long Bean (*Vigna Sinensis* L.) F 1 and its Parents. J. Agrotek Tropika, 3(3), pp.316–320. http://dx.doi.org/10.23960/jat.v3i3.1953.

Rachmawati, A., Anwar, S., And Karno, K. 2020. Pattern segregation character plant agronomy peanut long (*Vigna unguiculate* (l.) spp. sesquipedalus) F2 generation results cross varieties Super White x Fagiola IPB. J. of Agro Complex, 4(2), pp. 79–88. https://doi.org/10.14710/ joac.4.2.79-88

Reswari, H. A., Gratitude, M., And Suwarno, WB 2019. Contents anthocyanin and carotenoids and production components in purple and green podded long beans. J. Agronomi Indonesia, 47(1), pp.61–67. https://doi.org/10.24831/jai.v47i1.23402

Rizkyma, N. F., And Ariyanti, N. S. 2023. Phenology phase flowering And Fruiting and pollen production in long bean cultivar Sabrina. J. Bioresources, 9(2), ππ.87–95 . https://doi.org/10.29244/ jsdh.9.2.87– 95

Rolin, N., Zamzami, A., And Qadir, A. 2024. Influence size seed to Quality of mung bean sprouts (*Vigna radiata* L.) varieties vima 4 and vimil 1. Bulletin Agrohorticulture, 12(1), pp.123–135. https://doi.org/10.29244/agrob. v12i1. 51528

Sanhewe, AJ, and Ellis, RH 1996. Seed development and maturation in Phaseolus vulgaris I. Ability to germinate and to tolerate desiccation. Journal of experimental botany, 47(7), pp.949–958. https://doi.org/10.1093 /jxb/47.7.949

Setiabudi, P. F., Wijayanto, B., and Newspaper, A. 2023. Influence pruning leaves against quality production seed plant peanut long (*Vigna unguiculata* Ssp.). J. Sciences Agriculture, 30(1), pp.27–34. https://doi.org/10.55259 /jiip.v30i1.21

Shintawati, N., Anwar, S., and Kusmiyati, F. 2022. Evaluation of diversity and progress of F6 generation long bean (*Vigna unguiculata* (L.)) selection based on agronomic characters. J. Agricultural Science, 19(3), pp.165 – 174. https://doi.org/10.31849/jip.v19i3.10499.

Silaban, A., Sugiono, D., and Samaullah, HY 2021. The effect of giving young coconut water (*Cocos nucifera* L.) and variety types on viability and vigor seed peanut long (*Vigna sinensis* L.). J. Scientific Vehicle Education, 7(2), pp.142-148.

Simarmata, E. R., Ardian, A., And Sa'diyah, N. 2015. Appearance character production of long beans (*Vigna sinensis* L.) F1 generation and its parents. J. Tropical Agrotech, 3(3), pp.303–308. http://dx.doi.org/10.23960/jat.v3i3.1950

Soetiarso, TA, and Marpaung, L. 1995. Household consumer preferences for the quality of long beans. J. Horticulture, 5(3): pp.46–52.

Solekhati. 2018. Analysis of heterosis, dominance power and heritability of F1 long beans (*Vigna unguiculata* (L.) ssp.sesquipedalis) based on pod and seed diversity. Thesis. Diponegoro University.

I'm grateful, M., S. Sujiprihati, And R. Yunianti. 2018. Technique Breeding Plant. Spreader Self-reliance. Jakarta

Tambunan, S., Sebayang, N., Marlina, N., Sugiyono, B., Rompas, JP, Rosmiah, R., and Aminah, IS 2022. Testing several soybean varieties with organic fertilizer in Ultisol soil of Southeast Aceh Regency. J. Applied Agricultural Research, 22(3), pp.258–266. https://doi.org/10.25181/jppt.v22i3.2178

Togatorop, E., DN Sari., D. Novita., E. Susilo., and P. Parwito. 2021. Character correlation growth And results peanut long local in land used ricefield. J. of Science Education, 5(3), pp. 389–393. https://doi.org/10.33369/ pendipa.5.3.389–393.

USDA. 1927. Germplasm Resources Information Network (GRIN Taxonomy). National Germplasm Resources Laboratory, Beltsville, Maryland. https://npgsweb.ars-grin.gov/gringlobal/taxon/taxonomydetail?id=402452. (accessed 18 June 2025).

Widaryati. 2022. Test Power results advanced a number of strain peanut generation F7 in the lowlands. Thesis. Diponegoro University.

Widyawan, M. H., Hasanah, A., Taryono, Natural, T., Sayekti, R. S., Pramana, A. G., Wulandari, RA 2021. Multivariate analysis uncovers genetic diversity and relationship between agronomic traits, protein, and dietary fiber in yardlongbean (*Vigna unguiculate* a subsp. Sesquipedalis Verdc.). Biodiversitas, 21, pp. 5662–5671. https://doi.org/10.13057/biodiv/d211211.

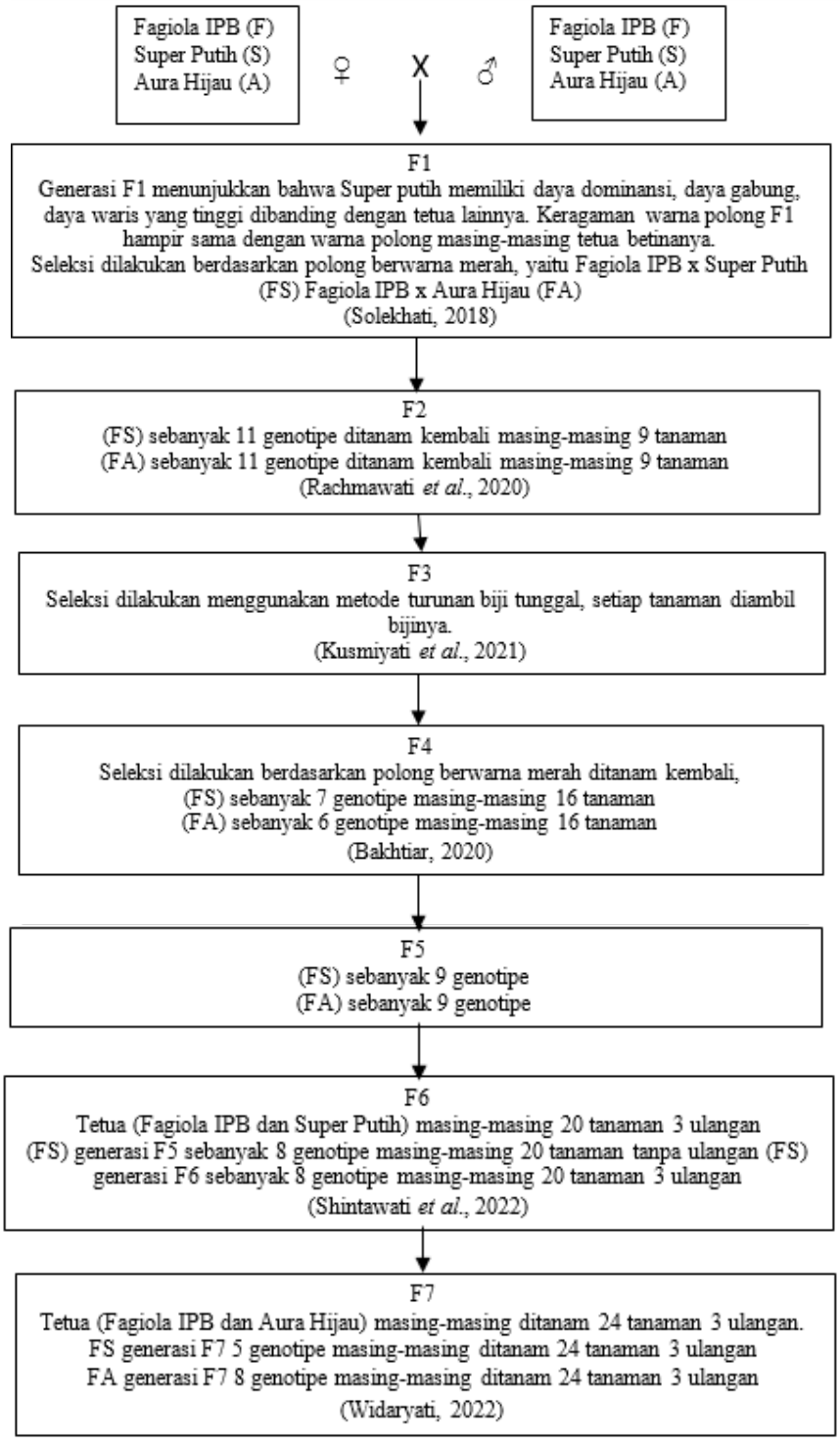
Jatropha curcas accessions L.). J. Agron Indonesia, 41(1), pp. 83–87. https://doi.org /10.24831/jai.v41i1.7082

Yuliani, E., and Fitriyah, H. 2018. Determination of protein content in raw, semi-cooked and cooked long beans (*Vigna unguiculata* L.) using the Kjeidahl method . J. Kimia Analis *,* 2(1), pp.12 – 16.

Zulfarosda, R., Damanhuri, D., Waluyo, B., And Kuswanto, K. 2020. Evaluation end of line hope peanut long (*Vigna sesquipedal* L. Fruwirth) pod purple. J. Agrotech Tropical, 8(2), pp.281–294. http://dx.doi.org/10.23960/jat.v8i2. 3580

ATTACHMENT

Appendix 1. Pedigree of the Promising Lines Studied. Genealogy from hopeful strains Which investigated is as following:



Attachment 2. Description Variety Fagiola IPB

Origin	: In country
History variety/origin proposal	: Selection pedigree from IPB crossbreeding KP13 x IPB KP14
Group varieties	: Pollinating Alone
Form cross section stem	: Aspect six
Color stem	: Green young (RHS – 146B)
Diameter stem	: 5.53–14.10 mm
Form leaf	: Ovate–lanceolate
Color leaf	: Green (RHS – 1378)
Color branching leaf trifoliate:	: Purple old (RHS N77 – A)
Color base tendon leaf	: Purple old (RHS N77 – A)
Size leaf	: Long: 17.30–33.78 cm; Wide: 11.10–22.96 cm
Flower shape	: Butterfly
Color crown flower	: Flag: Purple bright (RHS – 55C); Wing Purple bright (RHS – 55B)
Color box sari	: Yellow (RHS – 12A)
Color stalk sari	: White (RHS – 155B)
Color head pistil	: Green yellowish (RHS – 144B)
Color stalk pistil	: Yellow greenish (RHS – 144D)
Color petals flower	: Yellow ivory (RHS – 145D)
Age flowering	: 30.00 – 39.67 HST
Age harvest	: 43.00 – 46.67 HST
Pod shape	: Long and straight
Color pod young	: Purple old (RHS N77 – A)
Flavor pod young	: No bitter
Color pod old	: Purple old bright (RHS 71 – A)
Size pod	: Long: 41.33 – 66.11 cm; Diameter: 5.87 – 7.80 mm
Weight per pod	: 15.47 – 27.22 g
Amount seed per pod	: 13.97 – 19.07 seed
Amount pod per plant	: 13.00 – 33.25 pod
Weight pod per plant	: 310.25 – 543.84 g
Potential results	: 14.70 – 26.70 tons/ha
Contents anthocyanin pod young	: 0.017 0.019 mg/g
Age save	: 8 – 10 HSP
Form seed	: Kidney (kidney shape)
Amount color seed	: One color
Color seed main	: Chocolate (RHS 200 – B)
Color seed secondary	: No There is
Weight 1000 seed	: 169.31 – 206.07 g
Need seed per hectares	: 9.14 – 11.12 kg
Characteristics main	: Branching leaf trifoliate colored flower old (RHS N77 – A), Pod young colored purple old (RHS N77 – A)

Attachment 3. Description Variety Aura Green

Origin	: Results purification cooperation between PT. Pithy Seed with BPSBTPH Province Java East.
Genealogy	: Cross number selection KP – 2 – AT from Nganjuk Regency x selection number KP – 10 – 7 – AT from Regency Blitar.
Number selection	: KP – 270 – AT
Group varieties	: Strain
Type grow	: Creeping
Age start flowering	: 35 – 46 days after plant
Age harvest	: 44 – 58 days after plant
Form stem	: Side six
Color stem	: Purplish green
Form leaf	: Elongated triangle
Edge leaf	: Coarse (scaber)
Surface leaf	: Flat
End leaf	: Sharp
Color leaf	: Green
Long stalk leaf	: 8 – 11 cm
Color stalk leaf	: Green
Form flower	: Like butterfly
Color flower	: Purple reddish young
Form pod	: Round long (gilig)
Color pod young	: Bright green
Size pod	: Long 65.2 – 85.6 cm; Diameter 0.64 – 0.85 cm
Amount pod per bunch	: 1 – 3 pod
Amount pod per plant	: 40 – 50 pod
Flavor pod young	: sweet
Shelf life pod at temperature room	: 3 – 4 day
Amount seed per pod	: 19 – 23 seed
Color seed old	: White chocolate with comparison 70:30
Weight 1,000 seeds	: 175 g
Results pod fresh per hectares	: 24.06 – 28.31 tons/ha
Information	: Adapt with Good in plains low Until height 195 m above sea level
Proposer	: Arifin Interpretation (PT. Pithy Seed)
Researchers	: Agus Pratomo, Rr. Susiyati, Susanto (BPSBTPH Province Java East)
Released year	: 2005

Attachment 4. Calculation Need Fertilizer

Calculation 1 hectare $= \frac{\text{Area Land 1 Ha}}{\text{Distance Plant}}$

$= \frac{10{,}000}{0.5 \times 0.5}$

= 40,000 plants

Need manure (20 tons/ha) $= \frac{\text{Wide bed}}{\text{Wide Land 1 Ha}} \times \text{Dose Recommendation}$

$= \frac{9 \times 1 \times 0.5}{10{,}000} \times 20000 \text{ kg}$

= 9 kg/bed

Need Fertilizer Urea (80 kg/ha) $= \frac{\text{Dose fertilizer}}{\text{Amount population plant}}$

$= \frac{80}{40{,}000}$

= 0.002 kg/plant

= 2 gram/plant

Need Fertilizer TSP (80 kg/ha) $= \frac{\text{Dose fertilizer}}{\text{Amount population plant}}$

$= \frac{80}{40{,}000}$

= 0.002 kg/plant

= 2 gram/plant

Need Fertilizer KCI (107.5 kg/ha) $= \frac{\text{Dose fertilizer}}{\text{Amount population plant}}$

$= \frac{107.5}{40{,}000}$

= 0.003 kg/plant

= 3 gram/plant

Attachment 5. Documentation Study

Testing Power germinate

Exercise land

Application base fertilizer

Installation mulch

Planting

Measurement temperature and humidity

Stitching

Installation stake

Observation pest And disease

Fertilization

Pesticide spraying

Harvesting

Observation parameter

Drying pod

Appendix 6. Temperature and Humidity Data for the Period December 2024 to January 2025

No	Month	Last week –	Temperature (^{0}C)	Humidity (%)	Flat -Flat	
					Temperature (^{OC})	Humidity (%)
1	December	1	28.03	77.67	29.19	75.08
		2	32.03	73.67		
		3	29.23	73.50		
		4	29.09	75.38		
2	January	1	28.30	76.86	27.01	79.38
		2	27.45	77.26		
		3	27.14	79.19		
		4	27.04	79.21		
3	February	1	25.45	84.63	27.36	79.66
		2	26.70	83.00		
		3	29.40	72.00		
		4	27.90	79.00		

Attachment 7. Character Qualitative Line Hope And Elder Plant Peanut Long

Qualitative characters consist of pod shape, pod texture, seed shape, pod color, pod tip color, color seed main And color secondary seeds. Qualitative characters can be seen in a way digital with scan barcode beside.

(Character *barcode* qualitative)

Attachment 8. Fingerprint Variety Long Pod Line Hope And Elder Long Bean Plants

No	Line	Age Harvest	Group			Total	Flat-flat
			1	2	3		
		–(HSA)–	———— (cm) ————				
1	G1	8	48.11	45.56	43.42	137.08	45.69
		11	64.56	60.00	57.44	182.00	60.67
		14	69.83	63.67	71.50	205.00	68.33
		17	68.78	64.22	74.00	207.00	69.00
		20	67.55	69.92	67.83	205.30	68.43
		23	64.89	62.18	62.56	189.63	63.21
		26	64.75	62.11	59.31	186.17	62.06
		29	64.75	56.47	54.85	176.07	58.69
		32	54.92	52.44	52.19	159.56	53.19
		35	54.75	52.33	48.75	155.83	51.94
	Sub Total		622.88	588.91	591.85	1803.63	
	Average		62.29	58.89	59.18		60.12
2	G2	8	38.03	43.00	43.03	124.07	41.36
		11	55.64	58.43	56.17	170.24	56.75
		14	72.10	66.67	65.72	204.49	68.16
		17	73.63	70.33	66.64	210.61	70.20
		20	74.33	71.19	69.00	214.52	71.51
		23	70.00	69.36	63.83	203.19	67.73
		26	67.00	62.17	66.57	195.73	65.24
		29	64.63	60.97	63.09	188.69	62.90
		32	63.58	54.53	66.54	184.65	61.55
		35	60.19	58.94	55.72	174.86	58.29
	Sub Total		639.14	615.59	616.31	1871.05	
	Average		63.91	61.56	61.63		62.37
3	G3	8	43.14	44.14	32.78	120.06	40.02
		11	57.75	58.32	58.33	174.40	58.13
		14	65.49	60.42	66.50	192.40	64.13
		17	67.75	63.92	58.33	190.00	63.33
		20	60.50	58.75	63.89	183.13	61.04
		23	63.00	56.19	59.33	178.53	59.51
		26	53.46	61.19	57.81	172.47	57.49
		29	55.14	54.28	55.76	165.18	55.06
		32	50.87	46.89	48.19	145.95	48.65
		35	51.24	48.85	43.83	143.92	47.97
	Sub Total		568.34	552.94	544.77	1666.05	
	Average		56.83	55.29	54.48		55.54
4	G4	8	39.75	40.27	42.55	122.57	40.86
		11	59.08	54.84	55.33	169.26	56.42
		14	57.39	60.03	63.94	181.37	60.46
		17	59.32	60.88	61.39	181.59	60.53

Attachment 8. (Advanced)

		20	51.83	58.92	57.42	168.17	56.06
		23	53.17	54.22	46.18	153.57	51.19
		26	60.33	45.58	49.48	155.39	51.80
		29	53.38	56.08	45.42	154.88	51.63
		32	46.78	47.89	53.13	147.79	49.26
		35	45.61	41.51	45.23	132.35	44.12
	Sub Total		526.64	520.24	520.06	1566.94	
	Average		52.66	52.02	52.01		52.23
5	G5	8	51.82	47.89	51.46	151.17	50.39
		11	62.76	61.46	57.51	181.73	60.58
		14	66.42	66.08	64.18	196.67	65.56
		17	65.71	66.86	63.92	196.48	65.49
		20	67.14	64.60	52.35	184.09	61.36
		23	64.61	60.50	50.69	175.81	58.60
		26	57.73	57.06	58.53	173.31	57.77
		29	49.29	54.82	56.88	160.98	53.66
		32	48.59	51.17	53.71	153.47	51.16
		35	47.34	48.85	51.92	148.11	49.37
	Sub Total		581.40	579.27	561.14	1721.81	
	Average		58.14	57.93	56.11		57.39
6	G6	8	46.22	46.97	43.92	137.10	45.70
		11	58.22	66.17	61.69	186.08	62.03
		14	68.08	69.44	70.94	208.47	69.49
		17	73.17	75.17	69.28	217.61	72.54
		20	68.11	69.50	69.97	207.58	69.19
		23	62.42	62.24	61.00	185.65	61.88
		26	66.94	68.13	65.47	200.54	66.85
		29	67.27	51.22	52.42	170.91	56.97
		32	58.75	62.66	53.60	175.01	58.34
		35	57.69	53.16	57.92	168.77	56.26
	Sub Total		626.87	624.66	606.20	1857.73	
	Average		62.69	62.47	60.62		61.92
7	G7	8	38.32	44.95	47.28	130.55	43.52
		11	55.57	60.67	62.00	178.23	59.41
		14	69.35	64.83	60.78	194.96	64.99
		17	70.72	62.13	69.50	202.35	67.45
		20	69.33	62.50	53.21	185.04	61.68
		23	59.72	65.11	58.64	183.47	61.16
		26	61.22	61.61	63.92	186.75	62.25
		29	64.61	53.97	59.27	177.85	59.28
		32	50.63	58.28	57.07	165.97	55.32
		35	54.88	57.20	55.58	167.66	55.89
Sub Total			594.34	591.25	587.24	1772.83	
Average			59.43	59.12	58.72		59.09

Attachment 8. (Advanced)

8	G8	8	38.92	45.61	38.12	122.64	40.88
	(Fagila	11	50.97	54.08	45.06	150.11	50.04
	IPB)	14	56.08	57.93	56.11	170.12	56.71
		17	62.42	52.46	52.53	167.41	55.80
		20	57.94	47.43	57.83	163.21	54.40
		23	49.19	54.61	48.89	152.69	50.90
		26	40.61	50.36	50.61	141.58	47.19
		29	52.06	46.19	46.25	144.50	48.17
		32	49.75	53.96	39.78	143.49	47.83
		35	42.74	48.53	40.88	132.14	44.05
	Sub Total		500.68	511.17	476.05	1487.90	
	Average		50.07	51.12	47.61		49.60
9	G9	8	53.77	49.33	45.08	148.18	49.39
	(Aura	11	66.89	60.42	59.78	187.08	62.36
	Green)	14	69.89	75.67	70.94	216.50	72.17
		17	80.61	73.13	75.22	228.97	76.32
		20	82.17	84.28	70.93	237.38	79.13
		23	71.83	68.33	75.75	215.92	71.97
		26	65.83	71.06	83.67	220.56	73.52
		29	62.78	61.19	70.52	194.48	64.83
		32	62.32	57.06	60.31	179.68	59.89
		35	53.00	58.19	62.58	173.77	57.92
	Sub Total		669.08	658.64	674.79	2002.52	
	Average		66.90	65.86	67.48		66.75
Total			5329.38	5242.66	5178.42	15750.46	5250.15
Average			59.22	58.23	57.54		58.33

Strain code G1 = FA 1–1–4–3–6–8–B ; G2 = FS 3–4–7–1–B ; G3 = FA 3–2–13–14–B ; G4 = FA 1–1–5–3–18–B ; G5 = FA 1–1–10–1–6 ; G6 = FS 3–4–10–3–B ; G7 = FS 3–4–8–2–B ; G8 = Fagiola IPB And G9 = Aura Green

Table Plot Main

Line	Group			Total	Flat-flat
	1	2	3		
FA 1–1–4–3–6–8–B	622.88	588.91	591.85	1803.63	601.21
FS 3–4–7–1–B	639.14	615.59	616.31	1871.05	623.68
FA 3–2–13–14–B	568.34	552.94	544.77	1666.05	555.35
FA 1–1–5–3–18–B	526.64	520.24	520.06	1566.94	522.31
FA 1–1–10–1–6	581.40	579.27	561.14	1721.81	573.94
FS 3–4–10–3–B	626.87	624.66	606.20	1857.73	619.24
FS 3–4–8–2–B	594.34	591.25	587.24	1772.83	590.94
Fagiola IPB	500.68	511.17	476.05	1487.90	495.97
Aura Green	669.08	658.64	674.79	2002.52	667.51
Total	5329.38	5242.66	5178.42	15750.46	
Average	592.15	582.52	575.38		583.35

Attachment 8. Advanced

Table Child Plot

Line	Age Harvest (HSA)										Total	Flat-flat
	8	11	14	17	20	23	26	29	32	35		
FA 1–1–4–3–6–8–B	137.08	182.00	205.00	207.00	205.30	189.63	186.17	176.07	159.56	155.83	1803.63	183.09
FS 3–4–7–1–B	124.07	170.24	204.49	210.60	214.52	203.19	195.73	188.69	184.65	174.86	1871.05	188.47
FA 3–2–13–14–B	120.06	174.40	192.40	190.00	183.13	178.53	172.47	165.18	145.95	143.92	1666.05	169.13
FA 1–1–5–3–18–B	122.57	169.26	181.37	181.59	168.17	153.57	155.39	154.88	147.79	132.35	1566.94	159.40
FA 1–1–10–1–6	151.17	181.73	196.67	196.48	184.09	175.81	173.31	160.98	153.47	148.11	1721.81	174.86
FS 3–4–10–3–B	137.10	186.08	208.47	217.61	207.58	185.65	200.54	170.91	175.01	168.77	1857.73	187.66
FS 3–4–8–2–B	130.55	178.23	194.96	202.35	185.04	183.47	186.75	177.85	165.97	167.66	1772.83	178.35
Fagiola IPB	122.64	150.11	170.12	167.41	163.21	152.69	141.58	144.50	143.49	132.14	1487.90	150.64
Green Aura	148.18	187.08	216.50	228.97	237.38	215.92	220.56	194.48	179.68	173.77	2002.52	203.19
Total	1193.42	1579.14	1769.99	1802.02	1748.43	1638.46	1632.5	1533.54	1455.56	1397.41	15750.46	
Average	132.60	175.44	196.67	200.22	194.27	182.05	181.39	170.39	161.73	155.27		177.20

Attachment 8. (Advanced)

1. Degrees Free

db Group = r–1 = 3 –1 = 2

db Line = g –1 = 9–1 = 8

db Error $_{(g)}$ = (r–1).(g–1) = (2.8) = 16

db Age Harvest = p–1 = 10–1 = 9

db Line x Age Harvest = (g–1).(p–1) = (8.9) = 72

db Error $_{(b)}$ = (r–1).((p–1)+((g–1).(p–1)) = (2.(9+72)) = 162

db Total = (rgp)–1 = (3.9.10)–1 = 269

2. Factor Correct

FK =$\sum$Yij k) ^{2} /rgp = (15750.46) ^{2} /270 = 918803.67

3. Amount Square

JK Total (JKT) = $\sum$ijk Yijk $^{2-}$ FK

= (48.11 ^{2} + 45.56 ^{2} + 43.42 ^{2} +…+173.77 ^{2})–918803.67

= 23265.47

JK Group (JKK) =$\sum$k(Yk ^{2} /gp)–FK

= (5329.38 ^{2} + 5242.66 ^{2} + 5178.42 ^{2}) /90–918803.67

= 127.54

JK Line (JKG) = $\sum$i(Yi ^{2} /rp)–FK

= (1803.63 ^{2} + 1871.05 ^{2} + 1666.05 ^{2} +…+2002.52 ^{2}) / 30–918803.67

= 6782.39

Attachment 8. (Advanced)

JK Error $_{(g)}$ (JKE $_{(g)}$) $= (\sum(g_i r_k)^2/p) - FK - JKG$

$= (622.88^2 + 588.91^2 + 591.85^2 + ... + 674.79^2) - 918803.67 - 6782.39$

$= 142.12$

JK Harvest Age (JKP) $= \sum j(Yj^2 / rgp) - FK$

$= (1193.42^2 + 1579.14^2 + 1769.99^2 + \cdots + 1397.41^2) /27 - 918803.67$

$= 11855.90$

JK Interaction G x P (JKI) $= \sum ij\ (Yij^2/r) - FK - JKG - JKP$

$= (137.08^2 + 182^2 + 205^2 + \cdots + 173.77^2) /90 - 918803{,}67 - 6782{,}39 - 11855{,}90$

$= 1639.17$

JK Error $_{(p)}$ = Jakarta – JKK – JKG – JKE $_{(g)}$ – JKP – JKI

$= 23265.47 - 127.54 - 6782.39 - 142.12 - 11855.90 - 1639.17$

$= 2718.35$

4. Square Middle

KT Group (KTK) $= \frac{JKK}{db\ r} = \frac{127.54}{2} = 63.77$

KT Line (KTG) $= \frac{JKG}{db\ g} = \frac{6782.39}{8} = 847.80$

KT Error $_{(g)}$ (KTE $_{(g)}$) $= \frac{JKE(g)}{db\ Error\ (g)} = \frac{142.12}{16} = 8.89$

KT Age Harvest (ID card) $= \frac{JKP}{db\ p} = \frac{11855.90}{9} = 1317.32$

KT Interaction GxP (KTI) $= \frac{JKI}{db\ interaction\ GxP} = \frac{1639.17}{72} = 22.77$

KT Error $_{(p)}$ (KTE $_{(p)}$) $= \frac{JKE(p)}{db\ Error\ (p)} = \frac{2718.35}{162} = 16.78$

Attachment 8. (Advanced)

5. Factor Correct

F Count Group $= \frac{KTK}{KTE(g)} = \frac{63.77}{8.89} = 7.18$

F Count Strain $= \frac{KTG}{KTE(g)} = \frac{847.80}{8.89} = 95.44$

F Count Age Harvest $= \frac{ID\ card}{KTE(p)} = \frac{1317.32}{16.78} = 78.51$

F Count Interaction GxP $= \frac{KTI}{KTE(p)} = \frac{22.77}{16.78} = 1.36$

6. Table ANOVA

Source Diversity	Degrees Free	Amount Square	Square Middle	F Count	F Table
Plot Main					
Group (r)	2	127.54	63.77	7.18 *	3.63
Line (g)	8	6782.39	847.80	95.44 *	2.59
Error (g)	16	142.12	8.89		
Subplot					
Age Harvest (p)	9	11855.90	1317.32	78.51 *	1.94
GxP Interaction	72	1639.17	22.77	1.36 ns	1.38
Error (p)	162	2718.35	16.78		
Total	269	23265.47			

Notation * = Significant (F Count > F Table), ns = No significant

7. Coefficient Diversity

$KK_{(g)} = \frac{\sqrt{KTE(g)}}{Average\ Total} \times 100\% = \frac{\sqrt{8.89}}{58.34} \times 100\% = 5.11\%$

$KK_{(p)} = \frac{\sqrt{KTE(p)}}{Average\ Total} \times 100\% = \frac{\sqrt{16.78}}{58.34} \times 100\% = 7.02\%$

8. Variety

Variety Genotype ($\sigma^2 g$) = (KTG –KTE)/r = (847.80 –8.89)/3 =

279.64 Phenotype Variety ($\sigma^2 f$) = $\sigma^2 g$ + KTE = 279.64 + 8.89 =

288.53 Error Variance = KTE = 8.89

9. Heritability

Heritability ($h^2 bs$) = ($\sigma^2 g$ / $\sigma^2 f$) x 100%

= (279.64/288.53) x 100%

= 96.9%

10. Results Further Testing Different Real Honest (BNJ) on level 0.05

Results Sd (Error (Baku) Line (G) Peanut Long

$Sd_{KTE(g)} = \sqrt{\frac{}{Rp}} = \sqrt{\frac{8.89}{30}} = 0.54$

Q–Tukey value q(α,p,db)

Real level (α) = 0.05

Number of Treatments (G) =

9 Degrees of Error Freedom

$_g$ = 16

Tukey q–q value $_{(0.05,9,16)}$ =

5.03 Value HSD with level real

α HSD = $q_{(0.05,9,16)}$ x Sd

= 5.03 x 0.54

= 2.74

Attachment 8. (Advanced)

Table Matrix Mark Middle Character Long Treatment Pods Line (G) Plant Peanut Long

Line	Mark Middle	G9	G2	G6	G1	G7	G5	G3	G4	G8	Notation
		66.75	62.37	61.92	60.12	59.09	57.39	55.54	52.23	49.60	
G9	66.75	0.00 ns									a
G2	62.37	4.38*	0.00 ns								b
G6	61.92	4.83*	0.44 ns	0.00 ns							b
G1	60.12	6.63*	2.25 ns	1.80 ns	0.00 ns						bc
G7	59.09	7.66*	3.27*	2.83*	1.03 ns	0.00 ns					c
G5	57.39	9.36*	4.97*	4.53*	2.73 ns	1.70 ns	0.00 ns				CD
G3	55.54	11.22*	6.83*	6.39*	4.59*	3.56*	1.86 ns	0.00 ns			d
G4	52.23	14.52*	10.14*	9.69*	7.89*	6.86*	5.16*	3.30*	0.00 ns		e
G8	49.60	17.15*	12.77*	12.33*	10.52*	9.50*	7.80*	5.94*	2.63 ns	0.00 ns	e

G1 = FA 1–1–4–3–6–8–B ; G2 = FS 3–4–7–1–B ; G3 = FA 3–2–13–14–B ; G4 = FA 1–1–5–3–18–B ; G5 = FA 1–1–10–1–6 ; G6 = FS 3–4–10–3–B ; G7 = FS 3–4–8–2–B ; G8 = Fagiola IPB And G9 = Aura Green

Attachment 8. (Advanced)

Results Sd (Error (Baku) Age Harvest (P) Plant Peanut Long

$Sd_{KTE(p)} = \sqrt{\frac{}{rg}} = \sqrt{\frac{16.78}{27}} = 0.79$

Q–Tukey value q(α,p,db)

Real level (α) = 0.05

Number of Treatments (G) =

10 Degrees of Error

Freedom $_{g}$ = 162

Mark q–tukey $q_{(0.05,10.162)}$ =

4.54 Value HSD with level real

α HSD = $q_{(0.05,10.162)}$ x Sd

= 4.54 x 0.79

= 3.59

Attachment 8. (Advanced)

Table Matrix Mark Middle Character Long Pod Treatment Age Harvest (P) Plant Peanut Long

Harvest Age	Middle Value	P4 66.74	P3 65.56	P5 64.76	P6 60.68	P7 60.46	P2 58.49	P8 56.80	P9 53.91	P10 51.76	P1 44.20	Notation
P4	66.74	0.00 ns										a
P3	65.56	1.19 ns	0.00 ns									a
P5	64.76	1.98 ns	0.80 ns	0.00 ns								a
P6	60.68	6.06*	4.87*	4.07*	0.00 ns							b
P7	60.46	6.28*	5.09*	4.29*	0.22 ns	0.00 ns						b
P2	58.49	8.25*	7.07*	6.27*	2.20 ns	1.98 ns	0.00 ns					bc
P8	56.80	9.94*	8.76*	7.96*	3.89*	3.67 ns	1.69 ns	0.00 ns				CD
P9	53.91	12.83*	11.65*	10.85*	6.77*	6.55*	4.58 ns	2.89 ns	0.00 ns			of
P10	51.76	14.99*	13.80*	13.00*	8.93*	8.71*	6.73*	5.04*	2.15 ns	0.00 ns		e
P1	44.20	22.54*	21.35*	20.56*	16.48*	16.26*	14.29*	12.60*	9.71*	7.56*	0.00 ns	f

P1 = 8 HSA ; P2 = 11 HSA ; P3 = 14 HSA ; P4 = 17 HSA ; P5 = 20 HSA ; P6 = 23 HSA ; P7 = 26 HSA ; P8 = 29 HSA ; P9 = 32 HSA and P10 = 35 HSA

Appendix 9. Analysis of Variation in Fresh Pod Weight per Plant of Promising Lines and Long Bean Plant Elder.

No	Line	Age - Harvest	Group 1	Group 2	Group 3	Total	Flat - flat
		–(HSA)–		(g)			
1	G1	8	24.00	19.67	19.00	62.67	20.89
		11	74.33	74.67	52.67	201.67	67.22
		14	149.00	76.67	72.00	297.67	99.22
		17	75.33	59.00	59.33	193.67	64.56
		20	61.67	53.33	61.00	176.00	58.67
		23	24.00	29.00	21.33	74.33	24.78
		26	40.00	37.00	30.00	107.00	35.67
		29	37.67	30.33	11.67	79.67	26.56
		32	11.33	14.00	9.00	34.33	11.44
		35	9.33	10.00	8.67	28.00	9.33
	Sub Total		506.67	403.67	344.67	1255.00	
	Average		50.67	40.37	34.47		41.83
2	G2	8	17.67	12.00	20.00	49.67	16.56
		11	71.00	46.67	54.67	172.33	57.44
		14	82.67	74.00	107.00	263.67	87.89
		17	78.67	86.00	54.00	218.67	72.89
		20	106.67	79.00	56.33	242.00	80.67
		23	28.00	40.67	32.67	101.33	33.78
		26	38.67	11.67	47.00	97.33	32.44
		29	46.00	21.00	20.33	87.33	29.11
		32	13.33	10.33	15.67	39.33	13.11
		35	6.00	7.67	8.33	22.00	7.33
	Sub Total		488.67	389.00	416.00	1293.67	
	Average		48.87	38.90	41.60		43.12
3	G3	8	19.00	25.00	16.33	60.33	20.11
		11	73.33	117.67	75.33	266.33	88.78
		14	152.33	79.00	96.67	328.00	109.33
		17	113.33	96.67	105.33	315.33	105.11
		20	76.33	47.00	70.33	193.67	64.56
		23	33.00	52.67	30.67	116.33	38.78
		26	48.33	34.67	44.00	127.00	42.33
		29	26.67	21.67	16.33	64.67	21.56
		32	13.33	14.67	15.00	43.00	14.33
		35	12.67	13.67	11.67	38.00	12.67
	Sub Total		568.33	502.67	481.67	1552.67	
	Average		56.83	50.27	48.17		51.76
4	G4	8	15.33	39.00	26.33	80.67	26.89
		11	54.00	65.33	55.67	175.00	58.33

Attachment 9. (Advanced)

		14	56.67	73.33	94.67	224.67	74.89
		17	61.00	58.67	102.67	222.33	74.11
		20	63.33	51.00	54.33	168.67	56.22
		23	36.67	33.67	25.67	96.00	32.00
		26	34.33	36.00	24.00	94.33	31.44
		29	33.67	22.67	12.00	68.33	22.78
		32	13.00	12.33	9.67	35.00	11.67
		35	7.33	8.33	9.67	25.33	8.44
	Sub Total		375.33	400.33	414.67	1190.33	
	Average		37.53	40.03	41.47		39.68
5	G5	8	26.67	17.67	32.67	77.00	25.67
		11	37.00	82.33	58.00	177.33	59.11
		14	81.00	164.00	86.67	331.67	110.56
		17	88.33	127.00	93.00	308.33	102.78
		20	70.00	82.33	69.33	221.67	73.89
		23	45.67	25.33	30.00	101.00	33.67
		26	53.00	41.00	35.00	129.00	43.00
		29	33.33	23.00	18.33	74.67	24.89
		32	14.67	30.33	13.67	58.67	19.56
		35	12.67	12.33	11.00	36.00	12.00
	Sub Total		462.33	605.33	447.67	1515.33	
	Average		46.23	60.53	44.77		50.51
6	G6	8	18.00	20.00	16.00	54.00	18.00
		11	48.33	58.00	48.67	155.00	51.67
		14	71.67	98.67	120.67	291.00	97.00
		17	104.67	97.33	112.33	314.33	104.78
		20	91.67	56.67	74.67	223.00	74.33
		23	43.67	66.33	44.33	154.33	51.44
		26	58.33	40.00	26.67	125.00	41.67
		29	36.00	42.00	14.67	92.67	30.89
		32	13.33	25.00	9.33	47.67	15.89
		35	11.00	8.67	9.33	29.00	9.67
	Sub Total		496.67	512.67	476.67	1486.00	
	Average		49.67	51.27	47.67		49.53
7	G7	8	9.67	27.67	24.67	62.00	20.67
		11	30.33	46.33	37.33	114.00	38.00
		14	83.00	84.00	71.67	238.67	79.56
		17	90.33	78.00	102.00	270.33	90.11
		20	74.33	68.00	37.67	180	60.00
		23	27.33	34.33	50	111.67	37.22
		26	37.33	24.33	34.33	96.00	32.00
		29	24.00	13.33	17.33	54.67	18.22

Attachment 9. (Advanced)

		32	12.00	16.33	12.00	40.33	13.44
		35	10.00	10.00	9.67	29.67	9.89
	Sub Total		398.33	402.33	396.67	1197.33	
	Average		39.83	40.23	39.67		39.91
8	G8	8	24.67	38.00	18.00	80.67	26.89
	(Fagiola	11	41.00	92.67	41.00	174.67	58.22
	IPB)	14	89.67	102.33	79.67	271.67	90.56
		17	84.67	62.00	59.33	206.00	68.67
		20	54.33	30.33	65.67	150.33	50.11
		23	36.00	43.00	31.33	110.33	36.78
		26	32.33	50.33	27.00	109.67	36.56
		29	29.67	32.33	15.33	77.33	25.78
		32	14.67	23.67	12.00	50.33	16.78
		35	11.00	10.67	10.33	32.00	10.67
	Sub Total		418.00	485.33	359.67	1263.00	
	Average		41.80	48.53	35.97		42.10
9	G9	8	22.00	21.00	15.67	58.67	19.56
	(Aura	11	61.00	39.00	39.33	139.33	46.44
	Green)	14	57.33	86.33	56.00	199.67	66.56
		17	62.33	57.33	78.33	198.00	66.00
		20	76.67	78.00	79.67	234.33	78.11
		23	50.33	45.67	39.67	135.67	45.22
		26	40.67	37.67	61.33	139.67	46.56
		29	39.00	37.67	34.67	111.33	37.11
		32	13.67	16.33	11.00	41.00	13.67
		35	6.00	9.00	7.67	22.67	7.56
	Sub Total		429.00	428.00	423.33	1280.33	
	Average		42.90	42.80	42.33		42.68
Total			4143.33	4129.33	3761	12033.67	4011.22
Average			46.04	45.88	41.79	133.71	44.57

G1 = FA 1–1–4–3–6–8–B ; G2 = FS 3–4–7–1–B ; G3 = FA 3–2–13–14–B ; G4 = FA 1–1–5–3–18–B ; G5 = FA 1–1–10–1–6 ; G6 = FS 3–4–10–3–B ; G7 = FS 3–4–8–2–B ; G8 = Fagiola IPB and G9 = Green Aura.

Table Plot Main

Line	Group			Total	Average
	I	II	III		
FA 1–1–4–3–6–8–B	506.67	403.67	344.67	1255.00	418.33
FS 3–4–7–1–B	488.67	389.00	416.00	1293.67	431.22
FA 3–2–13–14–B	568.33	502.67	481.67	1552.67	517.56
FA 1–1–5–3–18–B	375.33	400.33	414.67	1190.33	396.78
FA 1–1–10–1–6	462.33	605.33	447.67	1515.33	505.11
FS 3–4–10–3–B	496.67	512.67	476.67	1486.00	495.33
FS 3–4–8–2–B	398.33	402.33	396.67	1197.33	399.11
Fagiola IPB	418.00	485.33	359.67	1263.00	421.00
Green Aura	429.00	428.00	423.33	1280.33	426.78
Total	4143.33	4129.33	3761.00	12033.67	
Average	460.37	458.81	417.89	1337.07	445.69

Attachment 9. (Advanced)

Table Child Plot

Line	Age Harvest (HSA)										Total	Flat -flat
	8	11	14	17	20	23	26	29	32	35		
FA 1–1–4–3–6–8–B	62.67	201.67	297.67	193.67	176.00	74.33	107.00	79.67	34.33	28.00	1255.00	41.83
FS 3–4–7–1–B	49.67	172.33	263.67	218.67	242.00	101.33	97.33	87.33	39.33	22.00	1293.67	43.12
FA 3–2–13–14–B	60.33	266.33	328.00	315.33	193.67	116.33	127.00	64.67	43.00	38.00	1552.67	51.76
FA 1–1–5–3–18–B	80.67	175.00	224.67	222.33	168.67	96.00	94.33	68.33	35.00	25.33	1190.33	39.68
FA 1–1–10–1–6	77.00	177.33	331.67	308.33	221.67	101.00	129.00	74.67	58.67	36.00	1515.33	50.51
FS 3–4–10–3–B	54.00	155.00	291.00	314.33	223.00	154.33	125.00	92.67	47.67	29.00	1486.00	49.53
FS 3–4–8–2–B	62.00	114.00	238.67	270.33	180.00	111.67	96.00	54.67	40.33	29.67	1197.33	39.91
Fagiola IPB	80.67	174.67	271.67	206.00	150.33	110.33	109.67	77.33	50.33	32.00	1263.00	42.10
Aura Green	58.67	139.33	199.67	198.00	234.33	135.67	139.67	111.33	41.00	22.67	1280.33	42.68
Total	585.67	1575.67	2446.67	2247	1789.67	1001	1025	710.67	389.67	262.67	12033.67	
Flat- flat	21.69	58.36	90.62	83.22	66.28	37.07	37.96	26.32	14.43	9.73		44.57

Attachment 9. (Advanced)

1. Table ANOVA

Source Diversity	Degrees Free	Amount Square	Square Middle	F Count	F Table
Plot Main					
Group (r)	2	1044.61	522.30	2.26 ^{ns}	3.63
Line (g)	8	5294.09	661.76	2.86 *	2.59
Error $_{(g)}$	16	3696.32	231.02		
Subplot					
Age Harvest (p)	9	198571.04	22063.45	119.42 *	1.94
GxP Interaction	72	18553.08	257.68	1.39 *	1.38
Error $_{(p)}$	162	29930.18	184.75		
Total	269	257089.32			

Notation * = Significant (F Count > F Table), ns = No significant

2. Coefficient Diversity

$$KK_{(g)} = \frac{\sqrt{KTE(g)}}{\text{Average Total}} \times 100\% = \frac{\sqrt{231.02}}{44.57} \times 100\% = 34.10\%$$

$$KK_{(p)} = \frac{\sqrt{KTE(p)}}{\text{Average Total}} \times 100\% = \frac{\sqrt{184.75}}{44.57} \times 100\% = 44.57\%$$

Mark coefficient diversity >20%, so data transformed use $\sqrt[3]{x}$

Attachment 9. (Advanced)

Transformation Data Weight Fresh Pod per Plant

No	Line	Age Harvest –(HSA)–	Group 1	2	3	Total	Flat – flat
			(g)				
1	G1	8	2.88	2.70	2.67	8.25	2.75
		11	4.20	4.21	3.75	12.16	4.05
		14	5.30	4.25	4.16	13.71	4.57
		17	4.22	3.89	3.90	12.02	4.01
		20	3.95	3.76	3.94	11.65	3.88
		23	2.88	3.07	2.77	8.73	2.91
		26	3.42	3.33	3.11	9.86	3.29
		29	3.35	3.12	2.27	8.74	2.91
		32	2.25	2.41	2.08	6.74	2.25
		35	2.11	2.15	2.05	6.31	2.10
	Sub Total		34.57	32.90	30.70	98.17	
	Average		3.46	3.29	3.07		3.27
2	G2	8	2.60	2.29	2.71	7.61	2.54
		11	4.14	3.60	3.80	11.54	3.85
		14	4.36	4.20	4.75	13.30	4.43
		17	4.28	4.41	3.78	12.48	4.16
		20	4.74	4.29	3.83	12.87	4.29
		23	3.04	3.44	3.20	9.67	3.22
		26	3.38	2.27	3.61	9.26	3.09
		29	3.58	2.76	2.73	9.07	3.02
		32	2.37	2.18	2.50	7.05	2.35
		35	1.82	1.97	2.03	5.82	1.94
	Sub Total		34.32	31.41	32.93	98.66	
	Average		48.87	3.43	3.14		9.87
3	G3	8	2.67	2.92	2.54	8.13	2.71
		11	4.19	4.90	4.22	13.31	4.44
		14	5.34	4.29	4.59	14.22	4.74
		17	4.84	4.59	4.72	14.15	4.72
		20	4.24	3.61	4.13	11.98	3.99
		23	3.21	3.75	3.13	10.09	3.36
		26	3.64	3.26	3.53	10.43	3.48
		29	2.99	2.79	2.54	8.31	2.77
		32	2.37	2.45	2.47	7.29	2.43
		35	2.33	2.39	2.27	6.99	2.33
	Sub Total		35.82	34.95	34.13	104.90	
	Average		3.58	3.49	3.41		3.50

Attachment 9. (Advanced)

4	G4	8	2.48	3.39	2.98	8.85	2.95
		11	3.78	4.03	3.82	11.63	3.88
		14	3.84	4.19	4.56	12.58	4.19
		17	3.94	3.89	4.68	12.50	4.17
		20	3.99	3.71	3.79	11.48	3.83
		23	3.32	3.23	2.95	9.50	3.17
		26	3.25	3.30	2.88	9.44	3.15
		29	3.23	2.83	2.29	8.35	2.78
		32	2.35	2.31	2.13	6.79	2.26
		35	1.94	2.03	2.13	6.10	2.03
	Sub Total		32.12	32.90	32.21	97.23	
	Average		3.21	3.29	3.22		3.24
5	G5	8	2.99	2.60	3.20	8.79	2.93
		11	3.33	4.35	3.87	11.55	3.85
		14	4.33	5.47	4.43	14.23	4.74
		17	4.45	5.03	4.53	14.01	4.67
		20	4.12	4.35	4.11	12.58	4.19
		23	3.57	2.94	3.11	9.62	3.21
		26	3.76	3.45	3.27	10.48	3.49
		29	3.22	2.84	2.64	8.70	2.90
		32	2.45	3.12	2.39	7.96	2.65
		35	2.33	2.31	2.22	6.87	2.29
	Sub Total		34.55	36.46	33.76	104.77	
	Average		3.45	3.65	3.38	10.48	3.49
6	G6	8	2.62	2.71	2.52	7.86	2.62
		11	3.64	3.87	3.65	11.16	3.72
		14	4.15	4.62	4.94	13.72	4.57
		17	4.71	4.60	4.83	14.14	4.71
		20	4.51	3.84	4.21	12.56	4.19
		23	3.52	4.05	3.54	11.11	3.70
		26	3.88	3.42	2.99	10.29	3.43
		29	3.30	3.48	2.45	9.23	3.08
		32	2.37	2.92	2.11	7.40	2.47
		35	2.22	2.05	2.11	6.38	2.13
	Sub Total		34.94	35.57	33.33	103.84	
	Average		3.49	3.56	3.33		3.46
7	G7	8	2.13	3.02	2.91	8.07	2.69
		11	3.12	3.59	3.34	10.05	3.35
		14	4.36	4.38	4.15	12.90	4.30
		17	4.49	4.27	4.67	13.43	4.48
		20	4.20	4.08	3.35	11.64	3.88

Attachment 9. (Advanced)

		23	3.01	3.25	3.68	9.95	3.32
		26	3.34	2.90	3.25	9.49	3.16
		29	2.88	2.37	2.59	7.84	2.61
		32	2.29	2.54	2.29	7.12	2.37
		35	2.15	2.15	2.13	6.44	2.15
	Sub Total		31.99	32.56	32.37	96.92	
	Average		3.20	3.26	3.24		3.23
8	G8	8	2.91	3.36	2.62	8.89	2.96
	(Fagiola	11	3.45	4.53	3.45	11.42	3.81
	IPB)	14	4.48	4.68	4.30	13.46	4.49
		17	4.39	3.96	3.90	12.25	4.08
		20	3.79	3.12	4.03	10.94	3.65
		23	3.30	3.50	3.15	9.96	3.32
		26	3.19	3.69	3.00	9.88	3.29
		29	3.10	3.19	2.48	8.77	2.92
		32	2.45	2.87	2.29	7.61	2.54
		35	2.22	2.20	2.18	6.60	2.20
	Sub Total		33.27	35.09	31.41	99.77	
	Average		3.33	3.51	3.14		3.33
9	G9	8	2.80	2.76	2.50	8.06	2.80
	(Aura	11	3.94	3.39	3.40	10.73	3.94
	Green)	14	3.86	4.42	3.83	12.10	3.86
		17	3.96	3.86	4.28	12.10	3.96
		20	4.25	4.27	4.30	12.82	4.25
		23	3.69	3.57	3.41	10.68	3.69
		26	3.44	3.35	3.94	10.73	3.44
		29	3.39	3.35	3.26	10.00	3.39
		32	2.39	2.54	2.22	7.15	2.39
		35	1.82	2.08	1.97	5.87	1.82
	Sub Total		429.00	428.00	423.33	1280.33	
	Flat -flat		42.90	42.80	42.33		42.68
Total			305.11	305.44	293.97	904.52	
Average			3.39	3.39	3.27		3.35

G1 = FA 1–1–4–3–6–8–B ; G2 = FS 3–4–7–1–B ; G3 = FA 3–2–13–14–B ; G4 = FA 1–1–5–3–18–B ; G5 = FA 1–1–10–1–6 ; G6 = FS 3–4–10–3–B ; G7 = FS 3–4–8–2–B ; G8 = Fagiola IPB And G9 = Aura Green.

Attachment 9. (Advanced)

Table Plot Main

Line	Group			Total	Average
	1	2	3		
FA 1–1–4–3–6–8–B	506.67	403.67	344.67	1255.00	418.33
FS 3–4–7–1–B	488.67	389.00	416.00	1293.67	431.22
FA 3–2–13–14–B	568.33	502.67	481.67	1552.67	517.56
FA 1–1–5–3–18–B	375.33	400.33	414.67	1190.33	396.78
FA 1–1–10–1–6	462.33	605.33	447.67	1515.33	505.11
FS 3–4–10–3–B	496.67	512.67	476.67	1486.00	495.33
FS 3–4–8–2–B	398.33	402.33	396.67	1197.33	399.11
Fagiola IPB	418.00	485.33	359.67	1263.00	421.00
Green Aura	429.00	428.00	423.33	1280.33	426.78
Total	4143.33	4129.33	3761.00	12033.67	
Average	460.37	458.81	417.89		445.69

Attachment 9. (Advanced)

Table Child Plot

Line	Age Harvest (HSA)										Total	Flat-flat
	8	11	14	17	20	23	26	29	32	35		
FA 1–1–4–3–6–8–B	8.25	12.16	13.71	12.02	11.65	8.73	9.86	8.74	6.74	6.31	98.17	9.82
FS 3–4–7–1–B	7.61	11.54	13.30	12.48	12.87	9.67	9.26	9.07	7.05	5.82	98.66	9.87
FA 3–2–13–14–B	8.13	13.31	14.22	14.15	11.98	10.09	10.43	8.31	7.29	6.99	104.90	10.49
FA 1–1–5–3–18–B	8.85	11.63	12.58	12.50	11.48	9.50	9.44	8.35	6.79	6.10	97.23	9.72
FA 1–1–10–1–6	8.79	11.55	14.23	14.01	12.58	9.62	10.48	8.70	7.96	6.87	104.77	10.48
FS 3–4–10–3–B	7.86	11.16	13.72	14.14	12.56	11.11	10.29	9.23	7.40	6.38	103.84	10.38
FS 3–4–8–2–B	8.07	10.05	12.90	13.43	11.64	9.95	9.49	7.84	7.12	6.44	96.92	9.69
Fagiola IPB	8.89	11.42	13.46	12.25	10.94	9.96	9.88	8.77	7.61	6.60	99.77	9.98
Aura Green	8.06	10.73	12.10	12.10	12.82	10.68	10.73	10.00	7.15	5.87	100.25	10.03
Total	74.51	103.56	120.21	117.08	108.52	89.30	89.85	79.01	65.10	57.38	904.52	90.45
Flat- flat	8.28	11.51	13.36	13.01	12.06	9.92	9.98	8.78	7.23	6.38	100.50	10.05

Attachment 9. (Advanced)

3. Table ANOVA

Source Diversity	Degrees Free	Amount Square	Square Middle	F Count	F Table
Plot Main					
Group (r)	2	0.94	0.47	4.26 *	3.63
Line (g)	8	2.74	0.34	3.10 ns	2.59
Error (g)	16	1.77	0.11		
Subplot					
Age Harvest (p)	9	156.22	17.36	186.19 *	1.94
GxP Interaction	72	8.70	0.12	1.30 ns	1.38
Error (p)	162	15.10	0.09		
Total	269	185.47			

Notation * = Significant (F Count > F Table), ns = No significant

4. Coefficient Diversity

$$KK_{(g)} = \frac{\sqrt{KTE(g)}}{\text{Average Total}} \times 100\% = \frac{\sqrt{0.11}}{3.35} \times 100\% = 9.92\%$$

$$KK_{(p)} = \frac{\sqrt{KTE(p)}}{\text{Average Total}} \times 100\% = \frac{\sqrt{0.09}}{3.35} \times 100\% = 9.11\%$$

5. Variety

Variety Genotype ($\sigma^2 g$) = (KTG –KTE)/r

= (0.34–0.11)/3

= 0.07

Variety Phenotype ($\sigma^2 f$) = $\sigma^2 g$ + KTE

= 0.07 + 0.11

= 0.18

Variety Error = KTE = 0.11

Attachment 9. (Advanced)

6. Heritability

Heritability ($h^2 bs$) $= (\sigma^2 g / \sigma^2 f) \times 100\%$

$= (0.07/0.18) \times 100\%$

$= 38.89\%$

7. Results Advanced Test Different Real Honest (BNJ) at the level 0.05

Results Sd (Error Standard) Harvest Age (P) Plant Peanut Long

$Sd = \sqrt{\frac{KTE(p)}{rg}} = \sqrt{\frac{0.09}{27}} = 0.058$

Mark q–tukey q(α,p,db)

Level real (α) = 0.05

Amount Treatment (P) = 10

Degrees of Error Freedom $_p$ = 162

Tukey's q–value $q_{(0.05,10,162)}$ = 4.537

HSD value with a significance level

of α

HSD $= q_{(0.05,10.162)} \times Sd$

$= 4{,}537 \times 0.058$

$= 0.27$

Attachment 9. (Advanced)

Table Matrix Middle Value Weight Fresh Age Pod Harvest (P) Bean Plants Long

Age Harvest	Mark Middle	P3	P4	P5	P2	P7	P6	P8	P1	P9	P10	Notation
		4.45	4.34	4.02	3.84	3.33	3.31	2.93	2.76	2.41	2.12	
P3	4.45	0.00 ns										a
P4	4.34	0.11 ns	0.00 ns									a
P5	4.02	0.43*	0.32*	0.00 ns								b
P2	3.84	0.61*	0.50*	0.18 ns	0.00 ns							b
P7	3.33	1.12*	1.01*	0.69*	0.51*	0.00 ns						c
P6	3.31	1.14*	1.03*	0.71*	0.53*	0.02 ns	0.00 ns					c
P8	2.93	1.52*	1.41*	1.09*	0.91*	0.40*	0.38*	0.00 ns				d
P1	2.76	1.69*	1.58*	1.26*	1.08*	0.57*	0.55*	0.17 ns	0.00 ns			d
P9	2.41	2.04*	1.93*	1.61*	1.43*	0.92*	0.90*	0.52*	0.35*	0.00 ns		e
P10	2.12	2.33*	2.22*	1.90*	1.72*	1.21*	1.19*	0.81*	0.64*	0.29*	0.00 ns	f

P1 = 8 HSA ; P2 = 11 HSA ; P3 = 14 HSA ; P4 = 17 HSA ; P5 = 20 HSA ; P6 = 23 HSA ; P7 = 26 HSA ; P8 = 29 HSA ; P9 = 32 HSA and P10 = 35 HSA

Attachment 10. Fingerprint Variety Amount Pod Line Hope And Elder Peanut Plants in the First and Second Harvest.

No	Line	Age Harvest	Group			Total	Flat - flat
			1	2	3		
		–(HSA)–	———— (Pod)---------				
1	G1	8	2.33	2.67	2.67	7.67	2.56
		11	2.67	2.67	2.67	8.00	2.67
		14	3.67	2.67	1.67	8.00	2.67
		17	2.33	3.00	2.00	7.33	2.44
		20	2.33	2.33	2.33	7.00	2.33
		23	3.67	4.00	3.00	10.67	3.56
		26	4.00	3.00	3.67	10.67	3.56
		29	4.00	4.00	3.67	11.67	3.89
		32	4.00	4.00	4.00	12.00	4.00
		35	3.67	2.00	4.00	9.67	3.22
	Sub Total		32.67	30.33	29.67	92.67	
	Average		3.27	3.03	2.97		3.09
2	G2	8	2.00	1.67	2.33	6.00	2.00
		11	2.33	2.33	2.00	6.67	2.22
		14	2.33	2.00	2.33	6.67	2.22
		17	2.33	2.33	2.00	6.67	2.22
		20	2.33	2.67	2.00	7.00	2.33
		23	2.00	3.33	2.00	7.33	2.44
		26	2.00	1.67	2.33	6.00	2.00
		29	3.67	4.00	3.67	11.33	3.78
		32	4.00	4.00	4.00	12.00	4.00
		35	2.67	3.00	3.33	9.00	3.00
	Sub Total		25.67	27.00	26.00	78.67	
	Average		2.57	2.70	2.60		2.62
3	G3	8	2.33	2.33	2.33	7.00	2.33
		11	2.67	4.00	2.67	9.33	3.11
		14	3.67	2.67	2.33	8.67	2.89
		17	2.67	2.67	3.00	8.33	2.78
		20	2.67	3.33	2.33	8.33	2.78
		23	3.00	4.00	2.67	9.67	3.22
		26	3.67	4.00	3.67	11.33	3.78
		29	4.00	4.00	4.00	12.00	4.00
		32	3.00	4.00	4.00	11.00	3.67
		35	3.33	2.33	2.33	8.00	2.67
	Sub Total		31.00	33.33	29.33	93.67	
	Average		3.10	3.33	2.93		3.12

Attachment 10. (Advanced)

4	G4	8	2.00	2.67	2.33	7.00	2.33
		11	2.00	2.67	2.00	6.67	2.22
		14	1.67	2.67	2.67	7.00	2.33
		17	2.67	2.33	3.00	8.00	2.67
		20	2.67	2.67	2.67	8.00	2.67
		23	2.67	4.00	2.33	9.00	3.00
		26	2.33	4.00	3.33	9.67	3.22
		29	2.00	2.00	3.33	7.33	2.44
		32	4.00	4.00	3.33	11.33	3.78
		35	3.33	4.00	4.00	11.33	3.78
	Sub Total		25.33	31.00	29.00	85.33	
	Average		2.53	3.10	2.90		2.84
5	G5	8	2.67	2.33	3.00	8.00	2.67
		11	1.67	3.33	2.67	7.67	2.56
		14	2.00	4.00	2.33	8.33	2.78
		17	2.33	3.67	2.67	8.67	2.89
		20	2.67	3.33	2.67	8.67	2.89
		23	4.00	3.33	3.00	10.33	3.44
		26	4.00	4.00	3.33	11.33	3.78
		29	4.00	4.00	4.00	12.00	4.00
		32	4.00	4.00	4.00	12.00	4.00
		35	4.00	4.00	3.67	11.67	3.89
	Sub Total		31.33	36.00	31.33	98.67	
	Average		3.13	3.60	3.13		3.29
6	G6	8	2.00	2.00	2.00	6.00	2.00
		11	2.33	2.00	2.33	6.67	2.22
		14	2.00	2.67	3.00	7.67	2.56
		17	2.33	2.33	3.00	7.67	2.56
		20	2.67	2.00	2.33	7.00	2.33
		23	2.67	3.33	2.33	8.33	2.78
		26	4.00	3.00	2.33	9.33	3.11
		29	4.00	4.00	4.00	12.00	4.00
		32	4.00	3.33	3.33	10.67	3.56
		35	4.00	3.67	3.33	11.00	3.67
	Sub Total		30.00	28.33	28.00	86.33	
	Average		3.00	2.83	2.8		2.88
7	G7	8	2.00	3.00	2.67	7.67	2.56
		11	1.67	2.00	1.67	5.33	1.78
		14	2.33	2.67	2.00	7.00	2.33
		17	2.67	3.67	2.67	9.00	3.00

Attachment 10. (Advanced)

	20	3.00	3.00	2.00	8.00	2.67
	23	4.33	4.00	3.33	11.67	3.89
	26	4.00	3.67	2.67	10.33	3.44
	29	4.00	4.00	4.00	12.00	4.00
	32	4.00	4.00	3.67	11.67	3.89
	35	4.00	3.67	4.00	11.67	3.89
Sub Total		32.00	33.67	28.67	94.33	
Average		3.20	3.37	2.87		3.14
8 G8	8	2.00	2.67	2.00	6.67	2.22
(Fagiola IPB)	11	2.33	3.33	2.33	8.00	2.67
	14	2.67	3.67	2.33	8.67	2.89
	17	2.67	3.00	2.33	8.00	2.67
	20	2.67	2.33	3.00	8.00	2.67
	23	3.33	4.33	3.67	11.33	3.78
	26	4.00	4.00	4.00	12.00	4.00
	29	4.00	4.00	4.00	12.00	4.00
	32	4.00	4.00	4.00	12.00	4.00
	35	4.00	4.00	3.67	11.67	3.89
Sub Total		31.67	35.33	31.33	98.33	
Average		3.17	3.53	3.13		3.28
9 G9	8	2.33	2.67	2.33	7.33	2.44
(Aura Green)	11	2.67	2.67	2.67	8.00	2.67
	14	1.67	3.00	2.67	7.33	2.44
	17	2.33	2.33	2.33	7.00	2.33
	20	2.00	2.00	2.33	6.33	2.11
	23	2.00	2.33	2.00	6.33	2.11
	26	1.67	2.33	2.00	6.00	2.00
	29	2.33	2.67	3.67	8.67	2.89
	32	3.33	4.00	3.67	11.00	3.67
	35	2.33	3.67	2.67	8.67	2.89
Sub Total		22.67	27.67	26.33	76.67	
Average		2.27	2.77	2.63		2.56
Total		262.33	282.67	259.67	804.67	
Flat -flat		2.91	3.14	2.89		2.98

G1 = FA 1–1–4–3–6–8–B ; G2 = FS 3–4–7–1–B ; G3 = FA 3–2–13–14–B ; G4 = FA 1–1–5–3–18–B ; G5 = FA 1–1–10–1–6 ; G6 = FS 3–4–10–3–B ; G7 = FS 3–4–8–2–B ; G8 = Fagiola IPB And G9 = Aura Green.

Attachment 10. (Advanced)

Table Plot Main

Line	Group			Total	Average
	1	2	3		
FA 1–1–4–3–6–8–B	32.67	30.33	29.67	92.67	30.89
FS 3–4–7–1–B	25.67	27.00	26.00	78.67	26.22
FA 3–2–13–14–B	31.00	33.33	29.33	93.67	31.22
FA 1–1–5–3–18–B	25.33	31.00	29.00	85.33	28.44
FA 1–1–10–1–6	31.33	36.00	31.33	98.67	32.89
FS 3–4–10–3–B	30.00	28.33	28.00	86.33	28.78
FS 3–4–8–2–B	32.00	33.67	28.67	94.33	31.44
Fagiola IPB	31.67	35.33	31.33	98.33	32.78
Aura Green	22.67	27.67	26.33	76.67	25.56
Total	262.33	282.67	259.67	804.67	268.22
Average	29.15	31.41	28.85	89.41	29.80

Attachment 10. Advanced

Table Child Plot

Line	Age Harvest (HSA)										Total	Average
	8	11	14	17	20	23	26	29	32	35		
FA 1–1–4–3–6–8–B	644.33	1715	2646.33	2445	2024	1136.67	1164.67	822	430.67	285.33	13314	1331.40
FS 3–4–7–1–B	645.33	1717	2649.33	2449	2029	1142.67	1171.67	830	439.67	295.33	13369	1336.90
FA 3–2–13–14–B	1290.67	3434	5298.67	4898	4058	2285.33	2343.33	1660	879.33	590.67	26738	2673.80
FA 1–1–5–3–18–B	2580.33	6866	10594.33	9792	8111	4564.67	4679.67	3312	1749.67	1171.33	53421	5342.10
FA 1–1–10–1–6	4516.33	12017	18542.33	17139	14198	7992.67	8194.67	5802	3068.67	2057.33	93528	9352.80
FS 3–4–10–3–B	8387.33	22317	34435.33	31829	26367	14842.67	15217.67	10774	5697.67	3819.33	173687	17368.70
FS 3–4–8–2–B	15484	41200	63572	58760	48676	27400	28092	19888	10516	7048	320636	32063.60
Fagiola IPB	28387.67	75534	116549.67	107728	89241	50235.33	51504.33	36464	19282.33	12924.67	587851	58785.10
Green Aura	52259	139051	214557	198317	164284	92478	94814	67126	35496	23792	1082174	108217.40
Total	114195	303851	468845	433357	358988	202078	207182	146678	77560	51984	2364718	236471.80
Average	12688.33	33761.22	52093.89	48150.78	39887.56	22453.11	23020.22	16297.56	8617.78	5776.00	262746.44	26274.64

Attachment 10. (Advanced)

1. Table ANOVA

Source Diversity	Degrees Free	Amount Square	Square Middle	F Count	F Table
Plot Main					
Group (r)	2	3.52	1.76	5.81 *	3.63
Line (g)	8	17.41	2.18	7.19 *	2.59
Error (g)	16	4.84	0.30		
Subplot					
Age Harvest (p)	9	72.12	8.01	41.61 *	1.94
GxP Interaction	72	28.82	0.40	2.08 *	1.38
Error (p)	162	31.20	0.19		
Total	269	157.89			

Notation * = Significant (F Count > F Table); ns = No significant

2. Coefficient Diversity

$$KK_{(g)} = \frac{\sqrt{KTE(g)}}{\text{Average Total}} \times 100\% = \frac{\sqrt{0.30}}{2.98} \times 100\% = 18.46\%$$

$$KK_{(p)} = \frac{\sqrt{KTE(p)}}{\text{Average Total}} \times 100\% = \frac{\sqrt{0.19}}{2.98} \times 100\% = 14.73\%$$

3. Variety

Variety Genotype ($\sigma^2 g$) = (KTG –KTE)/r

= (2.18–0.30)/3

= 0.63

Variety Phenotype ($\sigma^2 f$) = $\sigma^2 g$ + KTE

= 0.63 + 0.30

= 0.93

Variety Error = KTE = 0.30

Attachment 10. (Advanced)

4. Heritability

Heritability ($h^2 bs$) $= (\sigma^2 g / \sigma^2 f) \times 100\%$

$= (0.63/0.93) \times 100\%$

$= 67.74\%$

5. Results Test Carry on Different Real Honest (BNJ) on level 0.05

Results Sd (Error (Baku) Line (G) Plant Peanut Long

$Sd = \sqrt{\frac{KTE(g)}{Rp}} = \sqrt{\frac{0.30}{30}} = 0.1$

Mark q–tukey q(α,p,db)

Level real (α) = 0.05

Amount Treatment (G) = 9

Degrees of Error Freedom $_g$ = 16

Tukey q–value $q_{(0.05,9,16)}$ = 5.03

HSD value with real level α HSD

$= q_{(0.05,9,16)} \times Sd$

$= 5.03 \times 0.1$

$= 0.50$

Attachment 10. (Advanced)

Table Matrix Mark Middle Character Number of Pods Treatment Line (G) Plant Peanut Long

Line	Middl	G5	G8	G7	G3	G1	G6	G4	G2	G9	Notation
	e Value	3.29	3.28	3.14	3.12	3.09	2.88	2.84	2.62	2.56	
G5	3.29	0.00 ns									a
G8	3.28	0.01 ns	0.00 ns								a
G7	3.14	0.14 ns	0.13 ns	0.00 ns							a
G3	3.12	0.17 ns	0.16 ns	0.02 ns	0.00 ns						ab
G1	3.09	0.20 ns	0.19 ns	0.06 ns	0.03 ns	0.00 ns					ab
G6	2.88	0.41 ns	0.40 ns	0.27 ns	0.24 ns	0.21 ns	0.00 ns				a B C
G4	2.84	0.44 ns	0.43 ns	0.30 ns	0.28 ns	0.24 ns	0.03 ns	0.00 ns			a B C
G2	2.62	0.67*	0.66*	0.52*	0.50 ns	0.47 ns	0.26 ns	0.22 ns	0.00 ns		bc
G9	2.56	0.73*	0.72*	0.59*	0.57*	0.53*	0.32 ns	0.29 ns	0.07 ns	0.00 ns	c

G1 = FA 1–1–4–3–6–8–B ; G2 = FS 3–4–7–1–B ; G3 = FA 3–2–13–14–B ; G4 = FA 1–1–5–3–18–B ; G5 = FA 1–1–10–1–6 ; G6 = FS 3–4–10–3–B ; G7 = FS 3–4–8–2–B ; G8 = Fagiola IPB And G9 = Aura Green

Attachment 10. (Advanced)

Results Sd (Error Standard) Age Harvest (P) Plant Peanut Long

$$Sd_{KTE(p)} = \sqrt{\frac{}{rg}} = \sqrt{\frac{0.19}{27}} = 0.08$$

Mark q–tukey q(α,p,db)

Real level (α) = 0.05

Number of Treatments (P) = 10

Degrees Error Free $_p$ = 162

Q–Tukey q value $_{(0.05,10,162)}$ = 4.54

HSD value with real level α HSD

$= q_{(0.05,10,162)} \times Sd$

$= 4.54 \times 0.08$

$= 0.36$

Attachment 10. (Advanced)

Table Matrix Mark Middle Character Amount Pod Treatment Age Harvest (P) Plants Peanut Long

Harvest Age	Middle Value	P9	P8	P10	P7	P6	P4	P3	P5	P2	P1	Notation
		3.84	3.67	3.43	3.21	3.14	2.62	2.57	2.53	2.46	2.35	
P9	3.84	0.00 ns										a
P8	3.67	0.17 ns	0.00 ns									ab
P10	3.43	0.41*	0.23 ns	0.00 ns								bc
P7	3.21	0.63*	0.46*	0.22 ns	0.00 ns							c
P6	3.14	0.70*	0.53*	0.30 ns	0.07 ns	0.00 ns						c
P4	2.62	1.22*	1.05*	0.81*	0.59*	0.52*	0.00 ns					d
P3	2.57	1.27*	1.10*	0.86*	0.64*	0.57*	0.05 ns	0.00 ns				d
P5	2.53	1.31*	1.14*	0.90*	0.68*	0.60*	0.09 ns	0.04 ns	0.00 ns			d
P2	2.46	1.38*	1.21*	0.98*	0.75*	0.68*	0.16 ns	0.11 ns	0.07 ns	0.00 ns		d
P1	2.35	1.49*	1.32*	1.09*	0.86*	0.79*	0.27 ns	0.22 ns	0.19 ns	0.11 ns	0.00 ns	d

P1 = 8 HSA ; P2 = 11 HSA ; P3 = 14 HSA ; P4 = 17 HSA ; P5 = 20 HSA ; P6 = 23 HSA ; P7 = 26 HSA ; P8 = 29 HSA ; P9 = 32 HSA and P10 = 35 HSA

Attachment 10. (Advanced)

Results Sd (Error (Baku) Line (G) x Age Harvest (P) Plant Peanut Long

$Sd = \sqrt{\frac{KTE(p)}{r}} = \sqrt{\frac{0.19}{3}} = 0.25$

Mark q–tukey q(α,p,db)

Real level (α) = 0.05

Number of Treatments (G x P) = 90

Degrees of Error Freedom $_p$ = 162

Tukey's q–value $q_{(0.05,90,162)}$ = 4.54

HSD value with real level α HSD

$= q_{(0.05,90,162)}$ x Sd

= 4.54 x 0.25

= 1.14

Attachment 10. (Advanced)

Results Test BNJ

Line	Age Harvest (HSA)									
	8	11	14	17	20	23	26	29	32	35
FA 1–1–4–3–6–8–B	2.56bc	2.67bc	2.67bc	2.44bc	2.33c	3.56ab	3.56ab	3.89a	4.00a	3.22abc
FS 3–4–7–1–B	2.00b	2.22b	2.22b	2.22b	2.33b	2.44b	2.00b	3.78a	4.00a	3.00ab
FA 3–2–13–14–B	2.33c	3.11abc	2.89abc	2.78bc	2.78bc	3.22abc	3.78ab	4.00a	3.67ab	2.67bc
FA 1–1–5–3–18–B	2.33b	2.22b	2.33b	2.67ab	2.67ab	3.00ab	3.22ab	2.44b	3.78a	3.78a
FA 1–1–10–1–6	2.67 cd	2.56d	2.78bcd	2.89abcd	2.89abcd	3.44abcd	3.78abc	4.00a	4.00a	3.89ab
FS 3–4–10–3–B	2.00c	2.22c	2.56bc	2.56bc	2.33c	2.78bc	3.11abc	4.00a	3.56ab	3.67ab
FS 3–4–8–2–B	2.56bc	1.78c	2.33bc	3.00ab	2.67bc	3.89a	3.44ab	4.00a	3.89a	3.89a
Fagiola IPB	2.22c	2.67bc	2.89abc	2.67bc	2.67bc	3.78ab	4.00a	4.00a	4.00a	3.89a
Aura Green	2.44b	2.67ab	2.44b	2.33b	2.11b	2.11b	2.00b	2.89ab	3.67a	2.89ab

Appendix 11. Variety Fingerprint Shelf Life of Fresh Pods of Harapan Line and Long Bean Plant Parents.

No	Line	Harvest Age	Group 1	Group 2	Group 3	Total	Average
		–(HSA)–	——— (Day) --------				
1	G1	8	9	9	6	24	8
		11	6	6	6	18	6
		14	6	6	6	18	6
		17	3	3	3	9	3
		20	2	2	2	6	2
		23	1	1	1	3	1
		26	0	0	0	0	0
		29	0	0	0	0	0
		32	0	0	0	0	0
		35	0	0	0	0	0
	Sub Total		27	27	24	78	
	Average		2.7	2.7	2.4		2.6
2	G2	8	9	9	9	27	9
		11	6	6	9	21	7
		14	6	6	6	18	6
		17	3	3	3	9	3
		20	2	2	2	6	2
		23	1	1	1	3	1
		26	0	0	0	0	0
		29	0	0	0	0	0
		32	0	0	0	0	0
		35	0	0	0	0	0
	Sub Total		27	27	30	84	
	Average		2.7	2.7	3		2.8
3	G3	8	9	9	9	27	9
		11	6	6	6	18	6
		14	6	6	6	18	6
		17	3	3	3	9	3
		20	2	2	2	6	2
		23	1	1	1	3	1
		26	0	0	0	0	0
		29	0	0	0	0	0
		32	0	0	0	0	0
		35	0	0	0	0	0
	Sub Total		27	27	27	81	
	Average		2.7	2.7	2.7		2.7
4	G4	8	6	9	9	24	8
		11	6	6	6	18	6
		14	6	6	6	18	6

Attachment 11. (Advanced)

		17	3	3	3	9	3
		20	2	2	2	6	2
		23	1	1	1	3	1
		26	0	0	0	0	0
		29	0	0	0	0	0
		32	0	0	0	0	0
		35	0	0	0	0	0
	Sub Total		24	27	27	78	
	Average		2.4	2.7	2.7		2.6
5	G5	8	9	9	6	24	8
		11	6	6	9	21	7
		14	6	6	6	18	6
		17	3	3	3	9	3
		20	2	2	2	6	2
		23	1	1	1	3	1
		26	0	0	0	0	0
		29	0	0	0	0	0
		32	0	0	0	0	0
		35	0	0	0	0	0
	Sub Total		27	27	27	81	
	Average		2.7	2.7	2.7		2.7
6	G6	8	9	9	6	24	8
		11	6	6	6	18	6
		14	6	6	6	18	6
		17	3	3	3	9	3
		20	2	2	2	6	2
		23	1	1	1	3	1
		26	0	0	0	0	0
		29	0	0	0	0	0
		32	0	0	0	0	0
		35	0	0	0	0	0
	Sub Total		27	27	24	78	
	Average		2.7	2.7	2.4		2.6
7	G7	8	6	9	9	24	8
		11	6	6	6	18	6
		14	6	6	6	18	6
		17	3	3	3	9	3
		20	2	2	2	6	2
		23	1	1	1	3	1
		26	0	0	0	0	0
		29	0	0	0	0	0
		32	0	0	0	0	0
		35	0	0	0	0	0

Attachment 11. (Advanced)

	Sub Total		24	27	27	78	
	Average		2.4	2.7	2.7		2.6
8	G8	8	9	6	9	24	8
		11	6	6	9	21	7
		14	6	6	6	18	6
		17	3	3	3	9	3
		20	2	2	2	6	2
		23	1	1	1	3	1
		26	0	0	0	0	0
		29	0	0	0	0	0
		32	0	0	0	0	0
		35	0	0	0	0	0
	Sub Total		27	24	30	81	
	Average		2.7	2.4	3		2.7
9	G9	8	9	9	6	24	8
		11	6	6	6	18	6
		14	6	6	6	18	6
		17	3	3	3	9	3
		20	2	2	2	6	2
		23	1	1	1	3	1
		26	0	0	0	0	0
		29	0	0	0	0	0
		32	0	0	0	0	0
		35	0	0	0	0	0
	Sub Total		27	27	24	78	
	Average		2.7	2.7	2.4		2.6
Total			237	240	240	717	
Average			26.33	26.67	26.67		26.56

G1 = FA 1–1–4–3–6–8–B ; G2 = FS 3–4–7–1–B ; G3 = FA 3–2–13–14–B ; G4 = FA 1–1–5–3–18–B ; G5 = FA 1–1–10–1–6 ; G6 = FS 3–4–10–3–B ; G7 = FS 3–4–8–2–B ; G8 = Fagiola IPB And G9 = Aura Green

Table Plot Main

Line	Group			Total	Average
	1	2	3		
FA 1–1–4–3–6–8–B	27	27	24	78	26
FS 3–4–7–1–B	27	27	30	84	28
FA 3–2–13–14–B	27	27	27	81	27
FA 1–1–5–3–18–B	24	27	27	78	26
FA 1–1–10–1–6	27	27	27	81	27
FS 3–4–10–3–B	27	27	24	78	26
FS 3–4–8–2–B	24	27	27	78	26
Fagiola IPB	27	24	30	81	27
Green Aura	27	27	24	78	26
Total	237	240	240	717	239
Average	26.33	26.67	26.67	79.67	26.56

Attachment 11. (Advanced)

Table Subplot

Line	Age Harvest (HSA)										Total	Flat-flat
	8	11	14	17	20	23	26	29	32	35		
FA 1–1–4–3–6–8–B	24	18	18	9	6	3	0	0	0	0	78	7.8
FS 3–4–7–1–B	27	21	18	9	6	3	0	0	0	0	84	8.4
FA 3–2–13–14–B	27	18	18	9	6	3	0	0	0	0	81	8.1
FA 1–1–5–3–18–B	24	18	18	9	6	3	0	0	0	0	78	7.8
FA 1–1–10–1–6	24	21	18	9	6	3	0	0	0	0	81	8.1
FS 3–4–10–3–B	24	18	18	9	6	3	0	0	0	0	78	7.8
FS 3–4–8–2–B	24	18	18	9	6	3	0	0	0	0	78	7.8
Fagiola IPB	24	21	18	9	6	3	0	0	0	0	81	8.1
Aura Green	24	18	18	9	6	3	0	0	0	0	78	7.8
Total	222	171	162	81	54	27	0	0	0	0	717	71.7
Average	24.67	19	18	9	6	3	0	0	0	0	79.67	7.97

Attachment 11. (Advanced)

1. Table ANOVA

Source Diversity	Degrees Free	Amount Square	Square Middle	F Count	F Table
Plot Main					
Group (r)	2	0.07	0.03	0.10 ^{ns}	3.63
Line (g)	8	1.27	0.16	0.48 ^{ns}	2.59
Error $_{(g)}$	16	5.33	0.33		
Subplot					
Age Harvest (p)	9	2354.30	261.59	776.14 *	2.50
GxP Interaction	72	9.40	0.13	0.39 ^{ns}	1.60
Error $_{(p)}$	162	54.60	0.34		
Total	269	2424.97			

Notation * = Significant (F Count > F Table); ns = No significant.

2. Coefficient Diversity

$$KK_{(g)} = \frac{\sqrt{KTE(g)}}{\text{Average Total}} \times 100\% = \frac{\sqrt{0.33}}{2.98} \times 100\% = 21.74\%$$

$$KK_{(p)} = \frac{\sqrt{KTE(p)}}{\text{Average Total}} \times 100\% = \frac{\sqrt{0.34}}{2.98} \times 100\% = 21.86\%$$

Mark coefficient diversity >20% so that data in transformation using $\sqrt[3]{x + 0.5}$

Results Transformation Age Save Pod Fresh Plant Long beans .

No	Galur	Umur Panen	Kelompok			Total	Rata–rata
			1	2	3		
		–(HSA)–	——————Hari——————				
1	G1	8	2,12	2,12	1,87	6,10	3,05
		11	1,87	1,87	1,87	5,60	2,80
		14	1,87	1,87	1,87	5,60	2,80
		17	1,52	1,52	1,52	4,55	2,28
		20	1,36	1,36	1,36	4,07	2,04
		23	1,14	1,14	1,14	3,43	1,72
		26	0,79	0,79	0,79	2,38	1,19
		29	0,79	0,79	0,79	2,38	1,19
		32	0,79	0,79	0,79	2,38	1,19
		35	0,79	0,79	0,79	2,38	1,19
	Sub Total		13,05	13,05	12,79	38,88	
	Rata–rata		1,30	1,30	1,28		1,94
2	G2	8	2,12	2,12	2,12	6,35	3,18
		11	1,87	1,87	2,12	5,85	2,93
		14	1,87	1,87	1,87	5,60	2,80
		17	1,52	1,52	1,52	4,55	2,28
		20	1,36	1,36	1,36	4,07	2,04
		23	1,14	1,14	1,14	3,43	1,72
		26	0,79	0,79	0,79	2,38	1,19
		29	0,79	0,79	0,79	2,38	1,19
		32	0,79	0,79	0,79	2,38	1,19
		35	0,79	0,79	0,79	2,38	1,19
	Sub Total		13,05	13,05	13,30	39,39	
	Rata–rata		1,30	1,30	1,33		1,97
3	G3	8	2,12	2,12	2,12	6,35	3,18
		11	1,87	1,87	1,87	5,60	2,80
		14	1,87	1,87	1,87	5,60	2,80
		17	1,52	1,52	1,52	4,55	2,28
		20	1,36	1,36	1,36	4,07	2,04
		23	1,14	1,14	1,14	3,43	1,72
		26	0,79	0,79	0,79	2,38	1,19
		29	0,79	0,79	0,79	2,38	1,19
		32	0,79	0,79	0,79	2,38	1,19
		35	0,79	0,79	0,79	2,38	1,19
	Sub Total		13,05	13,05	13,05	39,14	
	Rata–rata		1,30	1,30	1,30		1,96

Attachment 11. (Advanced)

4	G4	8	1.87	2.12	2.12	6.10	3.05

		11	1.87	1.87	1.87	5.60	2.80
		14	1.87	1.87	1.87	5.60	2.80
		17	1.52	1.52	1.52	4.55	2.28
		20	1.36	1.36	1.36	4.07	2.04
		23	1.14	1.14	1.14	3.43	1.72
		26	0.79	0.79	0.79	2.38	1.19
		29	0.79	0.79	0.79	2.38	1.19
		32	0.79	0.79	0.79	2.38	1.19
		35	0.79	0.79	0.79	2.38	1.19
	Sub Total		12.79	13.05	13.05	38.88	
	Average		1.28	1.30	1.30		1.94
5	G5	8	2.12	2.12	1.87	6.10	3.05
		11	1.87	1.87	2.12	5.85	2.93
		14	1.87	1.87	1.87	5.60	2.80
		17	1.52	1.52	1.52	4.55	2.28
		20	1.36	1.36	1.36	4.07	2.04
		23	1.14	1.14	1.14	3.43	1.72
		26	0.79	0.79	0.79	2.38	1.19
		29	0.79	0.79	0.79	2.38	1.19
		32	0.79	0.79	0.79	2.38	1.19
		35	0.79	0.79	0.79	2.38	1.19
	Sub Total		13.05	13.05	13.05	39.14	
	Average		1.30	1.30	1.30		1.96
6	G6	8	2.12	2.12	1.87	6.10	3.05
		11	1.87	1.87	1.87	5.60	2.80
		14	1.87	1.87	1.87	5.60	2.80
		17	1.52	1.52	1.52	4.55	2.28
		20	1.36	1.36	1.36	4.07	2.04
		23	1.14	1.14	1.14	3.43	1.72
		26	0.79	0.79	0.79	2.38	1.19
		29	0.79	0.79	0.79	2.38	1.19
		32	0.79	0.79	0.79	2.38	1.19
		35	0.79	0.79	0.79	2.38	1.19
	Sub Total		13.05	13.05	12.79	38.88	
	Average		1.30	1.30	1.28		1.94
7	G7	8	1.87	2.12	2.12	6.10	3.05
		11	1.87	1.87	1.87	5.60	2.80
		14	1.87	1.87	1.87	5.60	2.80
		17	1.52	1.52	1.52	4.55	2.28
		20	1.36	1.36	1.36	4.07	2.04
		23	1.14	1.14	1.14	3.43	1.72
		26	0.79	0.79	0.79	2.38	1.19

Attachment 11. (Advanced)

	29	0.79	0.79	0.79	2.38	1.19

		32	0.79	0.79	0.79	2.38	1.19
		35	0.79	0.79	0.79	2.38	1.19
	Sub Total		12.79	13.05	13.05	38.88	
	Average		1.28	1.30	1.30		1.94
8	G8	8	2.12	1.87	2.12	6.10	3.05
	(Fagiola	11	1.87	1.87	2.12	5.85	2.93
	IPB)	14	1.87	1.87	1.87	5.60	2.80
		17	1.52	1.52	1.52	4.55	2.28
		20	1.36	1.36	1.36	4.07	2.04
		23	1.14	1.14	1.14	3.43	1.72
		26	0.79	0.79	0.79	2.38	1.19
		29	0.79	0.79	0.79	2.38	1.19
		32	0.79	0.79	0.79	2.38	1.19
		35	0.79	0.79	0.79	2.38	1.19
	Sub Total		13.05	12.79	13.30	39.14	
	Average		1.30	1.28	1.33		1.96
9	G9	8	2.12	2.12	1.87	6.10	3.05
	(Aura	11	1.87	1.87	1.87	5.60	2.80
	Green)	14	1.87	1.87	1.87	5.60	2.80
		17	1.52	1.52	1.52	4.55	2.28
		20	1.36	1.36	1.36	4.07	2.04
		23	1.14	1.14	1.14	3.43	1.72
		26	0.79	0.79	0.79	2.38	1.19
		29	0.79	0.79	0.79	2.38	1.19
		32	0.79	0.79	0.79	2.38	1.19
		35	0.79	0.79	0.79	2.38	1.19
	Sub Total		13.05	13.05	12.79	38.88	
	Average		1.30	1.30	1.28		1.94
Total			116.93	117.19	117.17	351.21	
Average			12.99	13.02	13.02		13.01

G1 = FA 1–1–4–3–6–8–B ; G2 = FS 3–4–7–1–B ; G3 = FA 3–2–13–14–B ; G4 = FA 1–1–5–3–18–B ; G5 = FA 1–1–10–1–6 ; G6 = FS 3–4–10–3–B ; G7 = FS 3–4–8–2–B ; G8 = Fagiola IPB And G9 = Aura Green

Table Plot Main

Line	Group			Total	Average
	1	2	3		
FA 1–1–4–3–6–8–B	13.05	13.05	12.79	38.88	19.44
FS 3–4–7–1–B	13.05	13.05	13.30	39.39	19.69
FA 3–2–13–14–B	13.05	13.05	13.05	39.14	19.57
FA 1–1–5–3–18–B	12.79	13.05	13.05	38.88	19.44
FA 1–1–10–1–6	13.05	13.05	13.05	39.14	19.57
FS 3–4–10–3–B	13.05	13.05	12.79	38.88	19.44
FS 3–4–8–2–B	12.79	13.05	13.05	38.88	19.44
Fagiola IPB	13.05	12.79	13.30	39.14	19.57
Green Aura	13.05	13.05	12.79	38.88	19.44
Total	116.91	117.16	117.16	351.22	175.61
Average	23.38	23.43	23.43	70.24	35.12

Attachment 11. (Advanced)

Table Child Plot

Galur	Umur Panen (HSA)										Total	Rata–rata
	8	11	14	17	20	23	26	29	32	35		
FA 1–1–4–3–6–8–B	6,10	5,60	5,60	4,55	4,07	3,43	2,38	2,38	2,38	2,38	38,88	3,89
FS 3–4–7–1–B	6,35	5,85	5,60	4,55	4,07	3,43	2,38	2,38	2,38	2,38	39,39	3,94
FA 3–2–13–14–B	6,35	5,60	5,60	4,55	4,07	3,43	2,38	2,38	2,38	2,38	39,14	3,91
FA 1–1–5–3–18–B	6,10	5,60	5,60	4,55	4,07	3,43	2,38	2,38	2,38	2,38	38,88	3,89
FA 1–1–10–1–6	6,10	5,85	5,60	4,55	4,07	3,43	2,38	2,38	2,38	2,38	39,14	3,91
FS 3–4–10–3–B	6,10	5,60	5,60	4,55	4,07	3,43	2,38	2,38	2,38	2,38	38,88	3,89
FS 3–4–8–2–B	6,10	5,60	5,60	4,55	4,07	3,43	2,38	2,38	2,38	2,38	38,88	3,89
Fagiola IPB	6,10	5,85	5,60	4,55	4,07	3,43	2,38	2,38	2,38	2,38	39,14	3,91
Aura Hijau	6,10	5,60	5,60	4,55	4,07	3,43	2,38	2,38	2,38	2,38	38,88	3,89
Total	55,42	51,14	50,39	40,99	36,64	30,91	21,43	21,43	21,43	21,43	351,22	35,12
Rata–rata	6,16	5,68	5,60	4,55	4,07	3,43	2,38	2,38	2,38	2,38	39,02	3,90

Attachment 11. (Advanced)

1. Table ANOVA

Source Diversity	Degrees Free	Amount Square	Square Middle	F Count	F Table
Plot Main					
Group (r)	2	0.0005	0.0002	0.10 ns	3.63
Line (g)	8	0.0088	0.0011	0.48 ns	2.59
Error (g)	16	0.0370	0.0023		
Subplot					
Age Harvest (p)	9	64,0046	7,1116	3038.46 *	2.50
GxP Interaction	32	0.0653	0.0009	0.39 ns	1.60
Error (p)	72	0.3792	0.0023		
Total	134	64,4954			

Notation * = Significant (F Count > F Table); ns = No significant.

2. Coefficient Diversity

$$KK_{(g)} = \frac{\sqrt{KTE(g)}}{\text{Average Total}} \times 100\% = \frac{\sqrt{0.0023}}{1.94} \times 100\% = 3.70\%$$

$$KK_{(p)} = \frac{\sqrt{KTE(p)}}{\text{Average Total}} \times 100\% = \frac{\sqrt{0.0023}}{1.94} \times 100\% = 3.70\%$$

3. Variety

Variety Genotype ($\sigma^2 g$) = (KTG –KTE)/r

= (0.0011–0.0023)/3

= –0.0004

Variety Phenotype ($\sigma^2 f$) = $\sigma^2 g$ + KTE

= –0.0004 + 0.0023

= 0.0019

Variety Error = KTE = 0.0023

Attachment 11. (Advanced)

4. Heritability

Heritability (h^2bs) $= (\sigma^2 g / \sigma^2 f) \times 100\%$

$= (-0.0004/0.0019) \times 100\%$

$= 21.05\%$

5. Results Test Carry on Different Real Honest (BNJ) on level 0.05

Results Sd (Error Standard) Harvest Age (P) Plant Peanut Long

$Sd = \sqrt{\frac{KTE(p)}{rg}} = \sqrt{\frac{0.0023}{27}} = 0.0092$

Mark q–tukey q(α,p,db)

Level real (α) = 0.05

Amount Treatment (P) = 10

Degrees of Error Freedom $_p$ = 162

Tukey's q–value $q_{(0.05,10.72)}$ = 4.5372

HSD value with a significance level of

α

HSD $= q_{(0.05,10.162)} \times Sd$

$= 4,5372 \times 0.0092$

$= 0.042$

Attachment 11. (Advanced)

Table Matrix Character Middle Value Age Save Fresh Pods Age Treatment Harvest (P) Plant Long beans

Harvest Age	Middle Value	P1	P2	P3	P4	P5	P6	P7	P8	P9	P10	Notation
		3.08	2.84	2.80	2.28	2.04	1.72	1.19	1.19	1.19	1.19	
P1	3.08	0.00 ns										a
P2	2.84	0.24*	0.00 ns									b
P3	2.80	0.28*	0.04 ns	0.00 ns								b
P4	2.28	0.80*	0.56*	0.52*	0.00 ns							c
P5	2.04	1.04*	0.81*	0.76*	0.24*	0.00 ns						d
P6	1.72	1.36*	1.12*	1.08*	0.56*	0.32*	0.00 ns					e
P7	1.19	1.89*	1.65*	1.61*	1.09*	0.85*	0.53*	0.00 ns				f
P8	1.19	1.89*	1.65*	1.61*	1.09*	0.85*	0.53*	0.00 ns	0.00 ns			f
P9	1.19	1.89*	1.65*	1.61*	1.09*	0.85*	0.53*	0.00 ns	0.00 ns	0.00 ns		f
P10	1.19	1.89*	1.65*	1.61*	1.09*	0.85*	0.53*	0.00 ns	0.00 ns	0.00 ns	0.00 ns	f

P1 = 8 HSA ; P2 = 11 HSA ; P3 = 14 HSA ; P4 = 17 HSA ; P5 = 20 HSA ; P6 = 23 HSA ; P7 = 26 HSA ; P8 = 29 HSA ; P9 = 32 HSA and P10 = 35 HSA

Attachment 12. Fingerprint Variety Level Sweetness Line Hope And Elder Long Bean Plants

No	Line	Harvest Age	Group			Total	Flat - flat
			1	2	3		
		—(HSA)—	———	(Brix)	———		
1	G1	8	2.33	2.07	4.27	8.67	2.89
		11	4.20	4.27	3.87	12.33	4.11
		14	2.60	1.53	3.07	7.20	2.40
		17	0.93	1.40	1.00	3.33	1.11
		20	0.80	1.13	0.93	2.87	0.96
		23	0.00	0.60	0.07	0.67	0.22
		26	0.00	0.00	0.00	0.00	0.00
		29	0.00	0.00	0.00	0.00	0.00
		32	0.00	0.00	0.00	0.00	0.00
		35	0.00	0.00	0.00	0.00	0.00
	Sub Total		10.87	11.00	13.20	35.07	
	Average		1.09	1.10	1.32		1.17
2	G2	8	1.00	2.07	4.13	7.20	2.40
		11	3.60	4.13	4.00	11.73	3.91
		14	4.20	1.67	2.33	8.20	2.73
		17	1.80	1.93	1.67	5.40	1.80
		20	2.33	1.33	1.00	4.67	1.56
		23	0.67	0.80	1.00	2.47	0.82
		26	0.00	0.00	0.00	0.00	0.00
		29	0.00	0.00	0.00	0.00	0.00
		32	0.00	0.00	0.00	0.00	0.00
		35	0.00	0.00	0.00	0.00	0.00
	Sub Total		13.60	11.93	14.13	39.67	
	Average		1.36	1.19	1.41		1.32
3	G3	8	2.00	1.07	2.00	5.07	1.69
		11	4.40	3.87	4.07	12.33	4.11
		14	3.53	2.13	3.13	8.80	2.93
		17	2.13	2.20	2.00	6.33	2.11
		20	1.33	0.70	1.00	3.03	1.01
		23	0.33	0.20	0.67	1.20	0.40
		26	0.00	0.00	0.00	0.00	0.00
		29	0.00	0.00	0.00	0.00	0.00
		32	0.00	0.00	0.00	0.00	0.00
		35	0.00	0.00	0.00	0.00	0.00
	Sub Total		13.73	10.17	12.87	36.77	
	Average		1.37	1.02	1.29		1.23
4	G4	8	4.00	3.07	4.07	11.13	3.71

Attachment 12. (Advanced)

		11	2.87	3.53	2.53	8.93	2.98
		14	3.27	2.27	2.60	8.13	2.71
		17	1.73	1.67	1.33	4.73	1.58
		20	1.73	0.93	1.27	3.93	1.31
		23	0.33	0.40	1.00	1.73	0.58
		26	0.00	0.00	0.00	0.00	0.00
		29	0.00	0.00	0.00	0.00	0.00
		32	0.00	0.00	0.00	0.00	0.00
		35	0.00	0.00	0.00	0.00	0.00
	Sub Total		13.93	11.87	12.80	38.60	
	Average		1.39	1.19	1.28		1.29
5	G5	8	1.00	1.93	3.27	6.20	2.07
		11	5.00	3.93	3.67	12.60	4.20
		14	3.60	1.93	2.87	8.40	2.80
		17	1.40	1.80	1.67	4.87	1.62
		20	0.93	1.00	1.13	3.07	1.02
		23	0.20	0.60	0.67	1.47	0.49
		26	0.00	0.00	0.00	0.00	0.00
		29	0.00	0.00	0.00	0.00	0.00
		32	0.00	0.00	0.00	0.00	0.00
		35	0.00	0.00	0.00	0.00	0.00
	Sub Total		12.13	11.20	13.27	36.60	
	Average		1.21	1.12	1.33		1.22
6	G6	8	1.33	1.87	3.73	6.93	2.31
		11	4.00	5.07	5.07	14.13	4.71
		14	2.53	2.20	2.87	7.60	2.53
		17	2.00	2.07	0.93	5.00	1.67
		20	0.73	1.00	0.87	2.60	0.87
		23	0.60	0.93	0.73	2.27	0.76
		26	0.00	0.00	0.00	0.00	0.00
		29	0.00	0.00	0.00	0.00	0.00
		32	0.00	0.00	0.00	0.00	0.00
		35	0.00	0.00	0.00	0.00	0.00
	Sub Total		11.20	13.13	14.20	38.53	
	Average		1.12	1.31	1.42		1.28
7	G7	8	2.00	4.00	4.27	10.27	3.42
		11	4.03	3.80	4.07	11.90	3.97
		14	2.60	1.73	3.07	7.40	2.47
		17	2.13	1.07	2.67	5.87	1.96
		20	2.00	0.93	1.33	4.27	1.42
		23	0.07	0.00	1.33	1.40	0.47
		26	0.00	0.00	0.00	0.00	0.00

Attachment 12. (Advanced)

		29	0.00	0.00	0.00	0.00	0.00
		32	0.00	0.00	0.00	0.00	0.00
		35	0.00	0.00	0.00	0.00	0.00
	Sub Total		12.83	11.53	16.73	41.10	
	Average		1.28	1.15	1.67		1.37
8	G8	8	0.93	1.67	2.07	4.67	1.56
	(Fagiola	11	2.13	4.00	3.07	9.20	3.07
	IPB)	14	1.87	2.00	2.73	6.60	2.20
		17	1.13	1.47	1.00	3.60	1.20
		20	0.87	0.87	1.00	2.73	0.91
		23	0.40	0.20	0.33	0.93	0.31
		26	0.00	0.00	0.00	0.00	0.00
		29	0.00	0.00	0.00	0.00	0.00
		32	0.00	0.00	0.00	0.00	0.00
		35	0.00	0.00	0.00	0.00	0.00
	Sub Total		7.33	10.20	10.20	27.73	
	Average		0.73	1.02	1.02		0.92
9	G9	8	2.33	6.07	4.00	12.40	4.13
	(Aura	11	4.60	4.20	4.67	13.47	4.49
	Green)	14	4.00	4.00	4.47	12.47	4.16
		17	1.33	1.13	1.87	4.33	1.44
		20	1.20	1.00	1.80	4.00	1.33
		23	0.40	0.73	1.20	2.33	0.78
		26	0.00	0.00	0.00	0.00	0.00
		29	0.00	0.00	0.00	0.00	0.00
		32	0.00	0.00	0.00	0.00	0.00
		35	0.00	0.00	0.00	0.00	0.00
	Sub Total		13.87	17.13	18.00	49.00	
	Average		1.39	1.71	1.80		1.63
Total			109.45	108.17	125.44	343.06	
Flat -flat			1.22	1.20	1.39		1.27

G1 = FA 1–1–4–3–6–8–B ; G2 = FS 3–4–7–1–B ; G3 = FA 3–2–13–14–B ; G4 = FA 1–1–5–3–18–B ; G5 = FA 1–1–10–1–6 ; G6 = FS 3–4–10–3–B ; G7 = FS 3–4–8–2–B ; G8 = Fagiola IPB And G9 = Aura Green.

Attachment 12. (Advanced)

Table Plot Main

Line	Group			Total	Flat-flat
	1	2	3		
FA 1–1–4–3–6–8–B	10.87	11.00	13.20	35.07	11.69
FS 3–4–7–1–B	13.60	11.93	14.13	39.67	13.22
FA 3–2–13–14–B	13.73	10.17	12.87	36.77	12.26
FA 1–1–5–3–18–B	13.93	11.87	12.80	38.60	12.87
FA 1–1–10–1–6	12.13	11.20	13.27	36.60	12.20
FS 3–4–10–3–B	11.20	13.13	14.20	38.53	12.84
FS 3–4–8–2–B	12.83	11.53	16.73	41.10	13.70
Fagiola IPB	7.33	10.20	10.20	27.73	9.24
Aura Green	13.87	17.13	18.00	35.53	16.33
Total	109.50	108.17	125.40	343.07	
Average	12.17	12.02	13.93		12.72

Attachment 12. Advanced

Table Child Plot

Line	Age Harvest (HSA)										Total	Flat-flat
	8	11	14	17	20	23	26	29	32	35		
FA 1–1–4–3–6–8–B	8.67	12.33	7.20	3.33	2.87	0.67	0.00	0.00	0.00	0.00	35.07	3.51
FS 3–4–7–1–B	7.20	11.73	8.20	5.40	4.67	2.47	0.00	0.00	0.00	0.00	39.67	3.97
FA 3–2–13–14–B	5.07	12.33	8.80	6.33	3.03	1.20	0.00	0.00	0.00	0.00	36.77	3.68
FA 1–1–5–3–18–B	11.13	8.93	8.13	4.73	3.93	1.73	0.00	0.00	0.00	0.00	38.60	3.86
FA 1–1–10–1–6	6.20	12.60	8.40	4.87	3.07	1.47	0.00	0.00	0.00	0.00	36.60	3.66
FS 3–4–10–3–B	6.93	14.13	7.60	5.00	2.60	2.27	0.00	0.00	0.00	0.00	38.53	3.85
FS 3–4–8–2–B	10.27	11.90	7.40	5.87	4.27	1.40	0.00	0.00	0.00	0.00	41.10	4.11
Fagiola IPB	4.67	9.20	6.60	3.60	2.73	0.93	0.00	0.00	0.00	0.00	27.73	2.77
Aura Green	12.40	13.47	12.47	4.33	4.00	2.33	0.00	0.00	0.00	0.00	49.00	4.90
Total	72.53	106.63	74.80	43.47	31.17	14.47	0.00	0.00	0.00	0.00	343.07	34.31
Average	8.06	11.85	8.31	4.83	3.46	1.61	0.00	0.00	0.00	0.00	38.12	3.81

Attachment 12. (Advanced)

1. Table ANOVA

Source Diversity	Degrees Free	Amount Square	Square Middle	F Count	F Table
Plot Main					
Group (r)	2	2.09	1.05	5.37 *	3.63
Line (g)	8	8.69	1.09	5.57 *	2.59
Error (g)	16	3.12	0.20		
Subplot					
Age Harvest (p)	9	504.97	56.11	215.93 *	1.94
Interaction GxP	72	32.08	0.45	1.71 *	1.38
Error (p)	162	42.09	0.26		
Total	269	593.04			

Notation * = Significant (F Count > F Table)

2. Coefficient Diversity

$$KK_{(g)} = \frac{\sqrt{KTE(g)}}{\text{Average}} \times 100\% = \frac{\sqrt{0.20}}{1.27} \times 100\% = 35.31\%$$

$$KK_{(p)} = \frac{\sqrt{KTE(p)}}{\text{Average}} \times 100\% = \frac{\sqrt{0.26}}{1.27} \times 100\% = 40.76\%$$

Mark coefficient diversity >30%, so data transformed use √x

Attachment 12. (Advanced)

Data Results Transformation on Parameter Sweetness Level .

No	Age Line Harvest	–(HSA)–	Group 1	2	3	Total	Average–flat
			——— (Brix) ———				
1	G1	8	1.68	1.60	2.18	5.47	1.82
		11	2.17	2.18	2.09	6.44	2.15
		14	1.76	1.43	1.89	5.08	1.69
		17	1.20	1.38	1.22	3.80	1.27
		20	1.14	1.28	1.20	3.62	1.21
		23	0.71	1.05	0.75	2.51	0.84
		26	0.71	0.71	0.71	2.12	0.71
		29	0.71	0.71	0.71	2.12	0.71
		32	0.71	0.71	0.71	2.12	0.71
		35	0.71	0.71	0.71	2.12	0.71
	Sub Total		11.48	11.74	12.16	35.39	
	Average		1.15	1.17	1.22		1.18
2	G2	8	1.22	1.60	2.15	4.98	1.66
		11	2.02	2.15	2.12	6.30	2.10
		14	2.17	1.47	1.68	5.32	1.77
		17	1.52	1.56	1.47	4.55	1.52
		20	1.68	1.35	1.22	4.26	1.42
		23	1.08	1.14	1.22	3.45	1.15
		26	0.71	0.71	0.71	2.12	0.71
		29	0.71	0.71	0.71	2.12	0.71
		32	0.71	0.71	0.71	2.12	0.71
		35	0.71	0.71	0.71	2.12	0.71
	Sub Total		12.53	12.11	12.71	37.34	
	Average		1.25	1.21	1.27		1.24
3	G3	8	1.58	1.25	1.58	4.41	1.47
		11	2.21	2.09	2.14	6.44	2.15
		14	2.01	1.62	1.91	5.54	1.85
		17	1.62	1.64	1.58	4.85	1.62
		20	1.35	1.10	1.22	3.67	1.22
		23	0.91	0.84	1.08	2.83	0.94
		26	0.71	0.71	0.71	2.12	0.71
		29	0.71	0.71	0.71	2.12	0.71
		32	0.71	0.71	0.71	2.12	0.71
		35	0.71	0.71	0.71	2.12	0.71
	Sub Total		12.52	11.37	12.34	36.23	
	Average		1.25	1.14	1.23		1.21
4	G4	8	2.12	1.89	2.14	6.15	2.05
		11	1.83	2.01	1.74	5.58	1.86

Attachment 12. (Advanced)

		14	1.94	1.66	1.76	5.36	1.79
		17	1.49	1.47	1.35	4.32	1.44
		20	1.49	1.20	1.33	4.02	1.34
		23	0.91	0.95	1.22	3.09	1.03
		26	0.71	0.71	0.71	2.12	0.71
		29	0.71	0.71	0.71	2.12	0.71
		32	0.71	0.71	0.71	2.12	0.71
		35	0.71	0.71	0.71	2.12	0.71
	Sub Total		12.63	12.01	12.38	37.01	
	Average		1.26	1.20	1.24		1.23
5	G5	8	1.22	1.56	1.94	4.73	1.58
		11	2.35	2.11	2.04	6.49	2.16
		14	2.02	1.56	1.83	5.42	1.81
		17	1.38	1.52	1.47	4.37	1.46
		20	1.20	1.22	1.28	3.70	1.23
		23	0.84	1.05	1.08	2.97	0.99
		26	0.71	0.71	0.71	2.12	0.71
		29	0.71	0.71	0.71	2.12	0.71
		32	0.71	0.71	0.71	2.12	0.71
		35	0.71	0.71	0.71	2.12	0.71
	Sub Total		11.84	11.84	12.48	36.15	
	Average		1.18	1.18	1.25		1.21
6	G6	8	1.35	1.54	2.06	4.95	1.65
		11	2.12	2.36	2.36	6.84	2.28
		14	1.74	1.64	1.83	5.22	1.74
		17	1.58	1.60	1.20	4.38	1.46
		20	1.11	1.22	1.17	3.50	1.17
		23	1.05	1.20	1.11	3.36	1.12
		26	0.71	0.71	0.71	2.12	0.71
		29	0.71	0.71	0.71	2.12	0.71
		32	0.71	0.71	0.71	2.12	0.71
		35	0.71	0.71	0.71	2.12	0.71
	Sub Total		11.79	12.39	12.56	36.74	
	Average		1.18	1.24	1.26		1.22
7	G7	8	1.58	2.12	2.18	5.89	1.96
		11	2.13	2.07	2.14	6.34	2.11
		14	1.76	1.49	1.89	5.14	1.71
		17	1.62	1.25	1.78	4.65	1.55
		20	1.58	1.20	1.35	4.13	1.38
		23	0.75	0.71	1.35	2.81	0.94
		26	0.71	0.71	0.71	2.12	0.71
		29	0.71	0.71	0.71	2.12	0.71
		32	0.71	0.71	0.71	2.12	0.71

Attachment 12. (Advanced)

		35	0.71	0.71	0.71	2.12	0.71
	Sub Total		12.26	11.67	13.52	37.45	
	Average		1.23	1.17	1.35		1.25
8	G8	8	1.20	1.47	1.60	4.27	1.42
		11	1.62	2.12	1.89	5.63	1.88
		14	1.54	1.58	1.80	4.92	1.64
		17	1.28	1.40	1.22	3.91	1.30
		20	1.17	1.17	1.22	3.56	1.19
		23	0.95	0.84	0.91	2.70	0.90
		26	0.71	0.71	0.71	2.12	0.71
		29	0.71	0.71	0.71	2.12	0.71
		32	0.71	0.71	0.71	2.12	0.71
		35	0.71	0.71	0.71	2.12	0.71
	Sub Total		10.58	11.41	11.48	33.47	
	Average		1.06	1.14	1.15		1.12
9	G9	8	1.68	2.56	2.12	6.37	2.12
		11	2.26	2.17	2.27	6.70	2.23
		14	2.12	2.12	2.23	6.47	2.16
		17	1.35	1.28	1.54	4.17	1.39
		20	1.30	1.22	1.52	4.05	1.35
		23	0.95	1.11	1.30	3.36	1.12
		26	0.71	0.71	0.71	2.12	0.71
		29	0.71	0.71	0.71	2.12	0.71
		32	0.71	0.71	0.71	2.12	0.71
		35	0.71	0.71	0.71	2.12	0.71
	Sub Total		12.50	13.29	13.81	39.60	
	Average		1.25	1.33	1.38		1,324
Total			96.33	95.45	100.88	292.66	
Average			12.04	11.93	12.61		12.19

G1 = FA 1–1–4–3–6–8–B ; G2 = FS 3–4–7–1–B ; G3 = FA 3–2–13–14–B ; G4 = FA 1–1–5–3–18–B ; G5 = FA 1–1–10–1–6 ; G6 = FS 3–4–10–3–B ; G7 = FS 3–4–8–2–B ; G8 = Fagiola IPB And G9 = Aura Green

Table Plot Main

Line	Group			Total	Average
	1	2	3		
FA 1–1–4–3–6–8–B	11.48	11.74	12.16	35.39	11.80
FS 3–4–7–1–B	12.53	12.11	12.71	37.34	12.45
FA 3–2–13–14–B	12.52	11.37	12.34	36.23	12.08
FA 1–1–5–3–18–B	12.63	12.01	12.38	37.01	12.34
FA 1–1–10–1–6	11.84	11.84	12.48	36.15	12.05
FS 3–4–10–3–B	11.79	12.39	12.56	36.74	12.25
FS 3–4–8–2–B	12.26	11.67	13.52	37.45	12.48
Fagiola IPB	10.58	11.41	11.48	33.47	11.16
Green Aura	12.50	13.29	13.81	39.60	13.20
Total	108.12	107.84	113.43	329.39	109.80
Average	12.01	11.98	12.60	36.60	12.20

Attachment 12. Advanced

Table Child Plot

Line	Age Harvest (HSA)										Total	Flat-flat
	8	11	14	17	20	23	26	29	32	35		
FA 1–1–4–3–6–8–B	35.39	35.39	35.39	35.39	35.39	35.39	35.39	35.39	35.39	35.39	35.39	35.39
FS 3–4–7–1–B	37.34	37.34	37.34	37.34	37.34	37.34	37.34	37.34	37.34	37.34	37.34	37.34
FA 3–2–13–14–B	36.23	36.23	36.23	36.23	36.23	36.23	36.23	36.23	36.23	36.23	36.23	36.23
FA 1–1–5–3–18–B	37.01	37.01	37.01	37.01	37.01	37.01	37.01	37.01	37.01	37.01	37.01	37.01
FA 1–1–10–1–6	36.15	36.15	36.15	36.15	36.15	36.15	36.15	36.15	36.15	36.15	36.15	36.15
FS 3–4–10–3–B	36.74	36.74	36.74	36.74	36.74	36.74	36.74	36.74	36.74	36.74	36.74	36.74
FS 3–4–8–2–B	37.45	37.45	37.45	37.45	37.45	37.45	37.45	37.45	37.45	37.45	37.45	37.45
Fagiola IPB	33.47	33.47	33.47	33.47	33.47	33.47	33.47	33.47	33.47	33.47	33.47	33.47
Aura Green	39.60	39.60	39.60	39.60	39.60	39.60	39.60	39.60	39.60	39.60	39.60	39.60
Total	329.39	329.39	329.39	329.39	329.39	329.39	329.39	329.39	329.39	329.39	329.39	329.39
Average	36.60	36.60	36.60	36.60	36.60	36.60	36.60	36.60	36.60	36.60	36.60	36.60

Attachment 12. (Advanced)

1. Table ANOVA

Source Diversity	Degrees Free	Amount Square	Square Middle	F Count	F Table
Plot Main					
Group (r)	2	0.22	0.11	5.99 *	3.63
Line (g)	8	0.73	0.09	5.00 *	2.59
Error (g)	16	0.29	0.02		
Subplot					
Age Harvest (p)	9	68.23	7.58	331.82 *	1.94
GxP Interaction	72	2.63	0.04	1.60 *	1.38
Error (p)	162	3.70	0.02		
Total	269	75.80			

Notation * = Significant (F Count > F Table)

2. Coefficient Diversity

$$KK_{(g)} = \frac{\sqrt{KTE(g)}}{\text{Average Total}} \times 100\% = \frac{\sqrt{0.02}}{12.19} \times 100\% = 11.07\%$$

$$KK_{(p)} = \frac{\sqrt{KTE(p)}}{\text{Average Total}} \times 100\% = \frac{\sqrt{0.02}}{12.19} \times 100\% = 12.38\%$$

3. Variety

Variety Genotype ($\sigma^2 g$) = (KTG –KTE)/r

= (0.09–0.02)/3

= 0.04

Variety Phenotype ($\sigma^2 f$) = $\sigma^2 g$ + KTE

= 0.04 + 0.02

= 0.06

Variety Error = KTE = 0.02

Attachment 12. (Advanced)

4. Heritability

Heritability ($h^2 bs$) $= (\sigma^2 g / \sigma^2 f) \times 100\%$

$= (0.04/0.06) \times 100\%$

$= 66.6\%$

5. Results Test Carry on Different Real Honest (BNJ) on level 0.05

Test Carry on Different Real Honest (BNJ) on level 0.05

Results Sd (Error (Baku) Line (G) Plant Peanut Long

$Sd = \sqrt{\frac{KTE(g)}{Rp}} = \sqrt{\frac{0,0}{2}} = \sqrt{\frac{0,0}{30}} = 0.026$

Mark q–tukey q(α,p,db)

Level real (α) = 0.05

Amount Treatment (G) = 9

Degrees of Error Freedom $_g$ = 16

Tukey q–value $q_{(0.05,9,16)}$ = 5.031

HSD value with a significance level

of α

HSD $= q_{(0,05,9,16)} \times Sd$

$= 5,031 \times 0.026$

$= 0.12$

Attachment 12. (Advanced)

Table Character Middle Value Sweetness Level Treatment Line (G) Plant Peanut Long

Line	Mark Middle	G9	G7	G2	G4	G6	G3	G5	G1	G8	Notation
		1.32	1.25	1.24	1.23	1.22	1.21	1.21	1.18	1.12	
G9	1.32	0.00 ns									a
G7	1.25	0.07 ns	0.00 ns								ab
G2	1.24	0.08 ns	0.00 ns	0.00 ns							ab
G4	1.23	0.09 ns	0.01 ns	0.01 ns	0.00 ns						ab
G6	1.22	0.10 ns	0.02 ns	0.02 ns	0.01 ns	0.00 ns					ab
G3	1.21	0.11 ns	0.04 ns	0.04 ns	0.03 ns	0.02 ns	0.00 ns				ab
G5	1.21	0.11 ns	0.04 ns	0.04 ns	0.03 ns	0.02 ns	0.00 ns	0.00 ns			ab
G1	1.18	0.14*	0.07 ns	0.06 ns	0.05 ns	0.04 ns	0.03 ns	0.03 ns	0.00 ns		bc
G8	1.12	0.20*	0.13*	0.13*	0.12 ns	0.11 ns	0.09 ns	0.09 ns	0.06 ns	0.00 ns	c

G1 = FA 1–1–4–3–6–8–B ; G2 = FS 3–4–7–1–B ; G3 = FA 3–2–13–14–B ; G4 = FA 1–1–5–3–18–B ; G5 = FA 1–1–10–1–6 ; G6 = FS 3–4–10–3–B ; G7 = FS 3–4–8–2–B ; G8 = Fagiola IPB And G9 = Aura Green.

Attachment 12. (Advanced)

Results Sd (Error Standard) Harvest Age (P) Plant Peanut Long

$$Sd_{KTE(p)} = \sqrt{\frac{}{rg}} = \sqrt{\frac{0.02}{27}} = 0.027$$

Mark q–tukey q(α,p,db)

Level real (α) = 0.05

Amount Treatment (P) = 10

Degrees of Error Freedom $_{p}$ = 162

Tukey's q–value $q_{(0.05,10,162)}$ = 4.537

HSD value with a significance level

of α

HSD = $q_{(0.05,10.162)}$ x Sd

= 4,537 x 0.027

= 0.122

Attachment 12. (Continued)

Table Mark Middle Character Level Sweetness Treatment Harvest Age (P) Plant Peanut Long

Age Harvest	Mark Middle	P2	P3	P1	P4	P5	P6	P7	P8	P9	P10	Notation
		2.10	1.80	1.75	1.44	1.28	1.00	0.71	0.71	0.71	0.71	
P2	2.10	0.00 ns										a
P3	1.80	0.31*	0.00 ns									b
P1	1.75	0.35*	0.05 ns	0.00 ns								b
P4	1.44	0.66*	0.35*	0.30*	0.00 ns							c
P5	1.28	0.82*	0.52*	0.47*	0.17*	0.00 ns						d
P6	1.00	1.10*	0.79*	0.75*	0.44*	0.28*	0.00 ns					e
P7	0.71	1.40*	1.09*	1.04*	0.74*	0.57*	0.30*	0.00 ns				f
P8	0.71	1.40*	1.09*	1.04*	0.74*	0.57*	0.30*	0.00 ns	0.00 ns			f
P9	0.71	1.40*	1.09*	1.04*	0.74*	0.57*	0.30*	0.00 ns	0.00 ns	0.00 ns		f
P10	0.71	1.40*	1.09*	1.04*	0.74*	0.57*	0.30*	0.00 ns	0.00 ns	0.00 ns	0.00 ns	f

P1 = 8 HSA ; P2 = 11 HSA ; P3 = 14 HSA ; P4 = 17 HSA ; P5 = 20 HSA ; P6 = 23 HSA ; P7 = 26 HSA ; P8 = 29 HSA ; P9 = 32 HSA and P10 = 35 HSA.

Attachment 12. (Advanced)

Results Sd (Error (Baku) Line (G) x Age Harvest (P) Plant Peanut Long

$Sd = \sqrt{\frac{KTE(p)}{r}} = \sqrt{\frac{0.02}{3}} = 0.082$

Mark q–tukey q(α,p,db)

Significance level (α) = 0.05

Number of Treatments (GxP) = 90

Degrees of Error Freedom $_p$ = 162

Tukey's q–value $q_{(0.05,90,162)}$ = 4.537

HSD value with a significance level

of α

HSD = $q_{(0.05,90,162)}$ x Sd

= 4,537 x 0.082

= 0.372

Attachment 12 **.** (Advanced)

Table Results Test BNJ Line (G) x Age Harvest (P) Character Level Sweetness Plant Peanut Long

Line	Age Harvest (HSA)									
	8	11	14	17	20	23	26	29	32	35
FA 1–1–4–3–6–8–B	1.82ab	2.15a	1.69b	1.27c	1.21 cd	0.84de	0.71e	0.71e	0.71e	0.71e
FS 3–4–7–1–B	1.66b	2.10a	1.77ab	1.52bc	1.42bc	1.15c	0.71d	0.71d	0.71d	0.71d
FA 3–2–13–14–B	1.47bc	2.15a	1.85ab	1.62bc	1.22 cd	0.94de	0.71e	0.71e	0.71e	0.71e
FA 1–1–5–3–18–B	2.05a	1.86a	1.79ab	1.44bc	1.34 cd	1.03de	0.71e	0.71e	0.71e	0.71e
FA 1–1–10–1–6	1.58bc	2.16a	1.81ab	1.46bc	1.23 cd	0.99de	0.71e	0.71e	0.71e	0.71e
FS 3–4–10–3–B	1.65b	2.28a	1.74b	1.46bc	1.17c	1.12c	0.71d	0.71d	0.71d	0.71d
FS 3–4–8–2–B	1.96ab	2.11a	1.71bc	1.55c	1.38c	0.94d	0.71d	0.71d	0.71d	0.71d
Fagiola IPB	1.42bc	1.88a	1.64ab	1.30bc	1.19 cd	0.90de	0.71e	0.71e	0.71e	0.71e
Aura Green	2.12a	2.23a	2.16a	1.39b	1.35b	1.12b	0.71c	0.71c	0.71c	0.71c

.

Attachment 13. Fingerprint Variety Weight Seed per Pod Line Hope And Long Bean Plant Elder.

No	Line	Harvest Age	Group 1	Group 2	Group 3	Total	Flat - flat
		–(HSA)–	——— (g) ———				
1	G1	8	0.77	0.51	0.43	1.71	0.57
		11	2.62	2.61	2.33	7.56	2.52
		14	6.40	7.71	4.76	18.87	6.29
		17	4.80	6.35	5.80	16.95	5.65
		20	8.17	7.41	8.10	23.68	7.89
		23	3.47	2.47	2.25	8.19	2.73
		26	4.87	6.77	5.07	16.71	5.57
		29	5.36	3.75	2.41	11.52	3.84
		32	2.63	1.84	1.74	6.21	2.07
		35	2.16	2.17	2.19	6.52	2.17
	Sub Total		41.25	41.59	35.08	117.92	
	Average		4.13	4.16	3.51		3.93
2	G2	8	0.12	0.33	0.48	0.93	0.31
		11	1.23	1.59	2.34	5.16	1.72
		14	3.46	7.45	6.23	17.14	5.71
		17	5.26	5.98	3.54	14.78	4.93
		20	7.05	5.74	7.23	20.02	6.67
		23	6.58	6.11	5.30	17.99	6.00
		26	5.14	3.94	4.82	13.90	4.63
		29	5.97	2.94	2.94	11.85	3.95
		32	2.06	2.44	1.88	6.38	2.13
		35	1.04	1.83	2.10	4.97	1.66
	Sub Total		37.91	38.35	36.86	113.12	
	Average		3.79	3.84	3.69		3.77
3	G3	8	0.55	1.52	0.50	2.57	0.86
		11	2.89	4.27	3.34	10.50	3.50
		14	6.12	7.34	4.17	17.63	5.88
		17	8.58	8.76	6.54	23.88	7.96
		20	9.08	6.39	9.32	24.79	8.26
		23	7.70	5.28	5.38	18.36	6.12
		26	7.99	4.02	9.60	21.61	7.20
		29	5.94	4.52	4.80	15.26	5.09
		32	1.98	4.43	3.30	9.71	3.24
		35	2.55	1.99	3.70	8.24	2.75
	Sub Total		52.83	48.52	50.65	152.00	
	Average		5.87	4.85	5.07		5.10
4	G4	8	1.00	0.49	1.12	2.61	0.87
		11	6.84	3.92	2.34	13.10	4.37

Attachment 13. (Continued)

		14	5.92	9.30	5.22	20.44	6.81
		17	7.41	6.63	8.78	22.82	7.61
		20	7.85	6.10	6.93	20.88	6.96
		23	5.52	3.84	4.92	14.28	4.76
		26	7.11	5.55	3.90	16.56	5.52
		29	4.97	3.10	2.80	10.87	3.62
		32	2.93	2.62	3.30	8.85	2.95
		35	2.27	1.65	1.93	5.85	1.95
	Sub Total		51.82	43.20	41.24	136.26	
	Average		5.18	4.32	4.12		4.54
5	G5	8	0.55	1.37	0.85	2.77	0.92
		11	2.01	3.13	2.73	7.87	2.62
		14	8.88	6.33	4.53	19.74	6.58
		17	8.16	8.37	8.46	24.99	8.33
		20	7.80	7.45	9.50	24.75	8.25
		23	6.15	4.85	8.81	19.81	6.60
		26	8.77	5.63	5.23	19.63	6.54
		29	7.91	4.35	3.86	16.12	5.37
		32	3.48	4.78	2.64	10.90	3.63
		35	3.18	2.71	2.52	8.41	2.80
	Sub Total		56.89	48.97	49.13	154.99	
	Average		5.69	4.90	4.91		5.17
6	G6	8	0.25	0.52	0.63	1.40	0.47
		11	1.37	3.22	2.13	6.72	2.24
		14	5.61	5.73	3.48	14.82	4.94
		17	7.11	5.10	4.25	16.46	5.49
		20	6.94	6.45	7.22	20.61	6.87
		23	6.29	3.52	7.12	16.93	5.64
		26	6.50	5.25	5.19	16.94	5.65
		29	4.21	4.29	2.63	11.13	3.71
		32	2.67	3.21	2.72	8.60	2.87
		35	3.11	1.82	2.31	7.24	2.41
	Sub Total		44.06	39.11	37.68	120.85	
	Average		4.41	3.91	3.77		4.03
7	G7	8	1.14	1.59	0.56	3.29	1.10
		11	2.32	2.64	1.59	6.55	2.18
		14	5.34	4.44	5.86	15.64	5.21
		17	4.29	5.46	5.86	15.61	5.20
		20	7.64	9.02	3.81	20.47	6.82
		23	4.29	6.02	6.57	16.88	5.63
		26	5.78	5.30	5.44	16.52	5.51
		29	5.58	3.74	3.16	12.48	4.16

Attachment 13. (Advanced)

		32	2.96	3.83	3.01	9.80	3.27
		35	2.75	2.48	1.81	7.04	2.35
	Sub Total		42.09	44.52	37.67	124.28	
	Average		4.21	4.45	3.77		4.14
8	G8	8	0.82	1.15	0.58	2.55	0.85
	(Fagiola IPB)	11	1.61	4.45	1.95	8.01	2.67
		14	3.81	6.35	6.57	16.73	5.58
		17	7.65	7.76	7.58	22.99	7.66
		20	6.85	5.18	8.10	20.13	6.71
		23	6.89	5.18	5.18	17.25	5.75
		26	6.95	7.71	4.61	19.27	6.42
		29	7.30	5.93	3.01	16.24	5.41
		32	2.84	3.37	2.83	9.04	3.01
		35	2.70	2.28	2.42	7.40	2.47
	Sub Total		47.42	49.36	42.83	139.61	
	Average		4.74	4.94	4.28		4.65
9	G9	8	1.05	0.77	0.23	2.05	0.68
	(Green Aura)	11	0.96	1.28	1.11	3.35	1.12
		14	3.55	3.37	4.05	10.97	3.66
		17	5.80	5.22	5.44	16.46	5.49
		20	6.82	6.61	6.24	19.67	6.56
		23	5.43	5.46	7.35	18.24	6.08
		26	5.75	4.89	5.85	16.49	5.50
		29	5.31	4.35	4.52	14.18	4.73
		32	3.34	2.58	2.49	8.41	2.80
		35	1.67	2.68	2.55	6.90	2.30
	Sub Total		39.68	37.21	39.83	116.72	
	Average		3.97	3.72	3.98		3.89
Total			414.5	390.83	370.97	1176.3	392.1
Flat -flat			4.60	4.34	4.12	13.07	4.36

G1 = FA 1–1–4–3–6–8–B ; G2 = FS 3–4–7–1–B ; G3 = FA 3–2–13–14–B ; G4 = FA 1–1–5–3–18–B ; G5 = FA 1–1–10–1–6 ; G6 = FS 3–4–10–3–B ; G7 = FS 3–4–8–2–B ; G8 = Fagiola IPB And G9 = Aura Green.

Table Plot Main

Line	Group			Total	Average
	1	2	3		
FA 1–1–4–3–6–8–B	41.25	41.59	35.08	117.92	39.31
FS 3–4–7–1–B	37.91	38.35	36.86	113.12	37.71
FA 3–2–13–14–B	53.38	48.52	50.65	152.55	50.85
FA 1–1–5–3–18–B	51.82	43.20	41.24	136.26	45.42
FA 1–1–10–1–6	56.89	48.97	49.13	154.99	51.66
FS 3–4–10–3–B	44.06	39.11	37.68	120.85	40.28
FS 3–4–8–2–B	42.09	44.52	37.67	124.28	41.43
Fagiola IPB	47.42	49.36	42.83	139.61	46.54
Green Aura	39.68	37.21	39.83	116.72	38.91
Total	414.5	390.83	370.97	1176.3	
Average	46.06	43.43	41.22	130.70	43.57

Attachment 13. (Advanced)

Table Child Plot

Line	Age Harvest (HSA)										Total	Flat-flat
	8	11	14	17	20	23	26	29	32	35		
FA 1–1–4–3–6–8–B	1.71	7.56	18.87	16.95	23.68	8.19	16.71	11.52	6.21	6.52	117.92	11.79
FS 3–4–7–1–B	0.93	5.16	17.14	14.78	20.02	17.99	13.90	11.85	6.38	4.97	113.12	11.31
FA 3–2–13–14–B	2.02	10.5	17.63	23.88	24.79	18.36	21.61	15.26	9.71	8.24	152.00	15.20
FA 1–1–5–3–18–B	2.61	13.1	20.44	22.82	20.88	14.28	16.56	10.87	8.85	5.85	136.26	13.63
FA 1–1–10–1–6	2.77	7.87	19.74	24.99	24.75	19.81	19.63	16.12	10.9	8.41	154.99	15.50
FS 3–4–10–3–B	1.40	6.72	14.82	16.46	20.61	16.93	16.94	11.13	8.60	7.24	120.85	12.09
FS 3–4–8–2–B	3.29	6.55	15.64	15.61	20.47	16.88	16.52	12.48	9.80	7.04	124.28	12.43
Fagiola IPB	2.55	8.01	16.73	22.99	20.13	17.25	19.27	16.24	9.04	7.40	139.61	13.96
Aura Green	2.05	3.35	10.97	16.46	19.67	18.24	16.49	14.18	8.41	6.90	116.72	11.67
Total	19.33	68.82	151.98	174.94	195.00	147.93	157.63	119.65	77.90	62.57	1175.75	
Average	2.15	7.65	16.89	19.44	21.67	16.44	17.51	13.29	8.66	6.95		13.06

Attachment 13. (Advanced)

1. Table ANOVA

Source Diversity	Degrees Free	Amount Square	Square Middle	F Count	F Table
Plot Main					
Group (r)	2	8.92	4.46	6.47 *	3.63
Line (g)	8	68.05	8.51	12.34 *	2.59
Error (g)	16	11.03	0.69		
Subplot					
Age Harvest (p)	9	1068.56	118.73	101.93 *	1.94
GxP Interaction	72	111.54	1.55	1.33 ns	1.38
Error (p)	162	188.70	1.16		
Total	269	1456.80			

Notation * = Significant (F Count > F Table); ns = No significant.

2. Coefficient Diversity

$$KK_{(g)} = \frac{\sqrt{KTE(g)}}{\text{Average Total}} \times 100\% = \frac{\sqrt{0.69}}{4.36} \times 100\% = 19.43\%$$

$$KK_{(p)} = \frac{\sqrt{KTE(p)}}{\text{Average Total}} \times 100\% = \frac{\sqrt{1.16}}{4.36} \times 100\% = 25.26\%$$

Mark coefficient diversity >20%, so data transformed use $\sqrt[3]{x}$

Attachment 13. (Advanced)

Transformation Data Weight Seed per Pod.

No	Line	Age Harvest –(HSA)–	Group 1	2	3	Total	Flat-flat
			——— (g) ———				
1	G1	8	0.92	0.80	0.75	2.47	0.82
		11	1.38	1.38	1.33	4.08	1.36
		14	1.86	1.98	1.68	5.51	1.84
		17	1.69	1.85	1.80	5.34	1.78
		20	2.01	1.95	2.01	5.97	1.99
		23	1.51	1.35	1.31	4.18	1.39
		26	1.70	1.89	1.72	5.30	1.77
		29	1.75	1.55	1.34	4.64	1.55
		32	1.38	1.23	1.20	3.81	1.27
		35	1.29	1.29	1.30	3.89	1.30
	Sub Total		15.48	15.27	14.44	45.19	
	Flat- Flat		1.55	1.53	1.44	4.52	1.51
2	G2	8	0.49	0.69	0.78	1.97	0.66
		11	1.07	1.17	1.33	3.57	1.19
		14	1.51	1.95	1.84	5.31	1.77
		17	1.74	1.82	1.52	5.08	1.69
		20	1.92	1.79	1.93	5.64	1.88
		23	1.87	1.83	1.74	5.45	1.82
		26	1.73	1.58	1.69	4.99	1.66
		29	1.81	1.43	1.43	4.68	1.56
		32	1.27	1.35	1.23	3.85	1.28
		35	1.01	1.22	1.28	3.52	1.17
	Sub Total		14.43	14.83	14.79	44.05	14.68
	Flat- Flat		1.44	1.48	1.48	4.40	1.47
3	G3	8	0.82	1.15	0.79	2.76	0.92
		11	1.42	1.62	1.49	4.54	1.51
		14	1.83	1.94	1.61	5.38	1.79
		17	2.05	2.06	1.87	5.98	1.99
		20	2.09	1.86	2.10	6.05	2.02
		23	1.97	1.74	1.75	5.47	1.82
		26	2.00	1.59	2.13	5.71	1.90
		29	1.81	1.65	1.69	5.15	1.72
		32	1.26	1.64	1.49	4.39	1.46
		35	1.37	1.26	1.55	4.17	1.39
	Sub Total		16.61	16.52	16.47	49.60	
	Flat- Flat		1.66	1.65	1.65	4.96	1.65

Attachment 13. (Advanced)

4	G4	8	1.00	0.79	1.04	2.83	0.94
		11	1.90	1.58	1.33	4.80	1.60
		14	1.81	2.10	1.73	5.65	1.88
		17	1.95	1.88	2.06	5.89	1.96
		20	1.99	1.83	1.91	5.72	1.91
		23	1.77	1.57	1.70	5.03	1.68
		26	1.92	1.77	1.57	5.27	1.76
		29	1.71	1.46	1.41	4.57	1.52
		32	1.43	1.38	1.49	4.30	1.43
		35	1.31	1.18	1.25	3.74	1.25
	Sub Total		16.79	15.53	15.49	47.80	15.93
	Flat- Flat		1.68	1.55	1.55	4.78	1.59
5	G5	8	0.82	1.11	0.95	2.88	0.96
		11	1.26	1.46	1.40	4.12	1.37
		14	2.07	1.85	1.65	5.58	1.86
		17	2.01	2.03	2.04	6.08	2.03
		20	1.98	1.95	2.12	6.05	2.02
		23	1.83	1.69	2.07	5.59	1.86
		26	2.06	1.78	1.74	5.58	1.86
		29	1.99	1.63	1.57	5.19	1.73
		32	1.52	1.68	1.38	4.58	1.53
		35	1.47	1.39	1.36	4.23	1.41
	Sub Total		17.02	16.59	16.27	49.88	16.63
	Flat- Flat		1.70	1.66	1.63	4.99	1.66
6	G6	8	0.63	0.80	0.86	2.29	0.76
		11	1.11	1.48	1.29	3.87	1.29
		14	1.78	1.79	1.52	5.08	1.69
		17	1.92	1.72	1.62	5.26	1.75
		20	1.91	1.86	1.93	5.70	1.90
		23	1.85	1.52	1.92	5.29	1.76
		26	1.87	1.74	1.73	5.34	1.78
		29	1.61	1.62	1.38	4.62	1.54
		32	1.39	1.48	1.40	4.26	1.42
		35	1.46	1.22	1.32	4.00	1.33
	Sub Total		15.52	15.23	14.97	45.72	15.24
	Flat- Flat		1.55	1.52	1.50	4.57	1.52
7	G7	8	1.04	1.17	0.82	3.04	1.01
		11	1.32	1.38	1.17	3.87	1.29
		14	1.75	1.64	1.80	5.19	1.73
		17	1.62	1.76	1.80	5.19	1.73
		20	1.97	2.08	1.56	5.61	1.87
		23	1.62	1.82	1.87	5.32	1.77
		26	1.79	1.74	1.76	5.30	1.77

Attachment 13. (Advanced)

		29	1.77	1.55	1.47	4.79	1.60
		32	1.44	1.56	1.44	4.44	1.48
		35	1.40	1.35	1.22	3.97	1.32
	Sub Total		15.74	16.07	14.92	46.73	15.58
	Flat- Flat		1.57	1.61	1.49	4.67	1.56
8	G8	8	0.94	1.05	0.83	2.82	0.94
	(Fagiola	11	1.17	1.64	1.25	4.07	1.36
	IPB)	14	1.56	1.85	1.87	5.29	1.76
		17	1.97	1.98	1.96	5.91	1.97
		20	1.90	1.73	2.01	5.64	1.88
		23	1.90	1.73	1.73	5.36	1.79
		26	1.91	1.98	1.66	5.55	1.85
		29	1.94	1.81	1.44	5.19	1.73
		32	1.42	1.50	1.41	4.33	1.44
		35	1.39	1.32	1.34	4.05	1.35
	Sub Total		16.10	16.59	15.52	48.21	16.07
	Flat- Flat		1.61	1.66	1.55	4.82	1.61
9	G9	8	1.02	0.92	0.61	2.55	0.85
	(Aura	11	0.99	1.09	1.04	3.11	1.04
	Green)	14	1.53	1.50	1.59	4.62	1.54
		17	1.80	1.73	1.76	5.29	1.76
		20	1.90	1.88	1.84	5.61	1.87
		23	1.76	1.76	1.94	5.46	1.82
		26	1.79	1.70	1.80	5.29	1.76
		29	1.74	1.63	1.65	5.03	1.68
		32	1.49	1.37	1.36	4.22	1.41
		35	1.19	1.39	1.37	3.94	1.31
	Sub Total		15.20	14.96	14.96	45.12	15.04
	Flat- Flat		1,520	1,496	1,496	4,512	1.50
Total			142.90	141.58	137.83	422.31	
Average			15.88	15.73	15.31		15.64

G1 = FA 1–1–4–3–6–8–B ; G2 = FS 3–4–7–1–B ; G3 = FA 3–2–13–14–B ; G4 = FA 1–1–5–3–18–B ; G5 = FA 1–1–10–1–6 ; G6 = FS 3–4–10–3–B ; G7 = FS 3–4–8–2–B ; G8 = Fagiola IPB And G9 = Aura Green

Attachment 13. (Advanced)

Table Plot Main

Line	Group			Total	Average
	I	II	III		
FA 1–1–4–3–6–8–B	15.48	15.27	14.44	45.19	15.06
FS 3–4–7–1–B	14.43	14.83	14.79	44.05	14.68
FA 3–2–13–14–B	16.61	16.52	16.47	49.60	16.53
FA 1–1–5–3–18–B	16.79	15.53	15.49	47.80	15.93
FA 1–1–10–1–6	17.02	16.59	16.27	49.88	16.63
FS 3–4–10–3–B	15.52	15.23	14.97	45.72	15.24
FS 3–4–8–2–B	15.74	16.07	14.92	46.73	15.58
Fagiola IPB	16.10	16.59	15.52	48.21	16.07
Green Aura	15.20	14.97	14.96	45.12	15.04
Total	142.90	141.58	137.83	422.31	140.77
Average	15.88	15.73	15.31	46.92	15.64

Attachment 13. (Advanced)

Table Subplot

Line	Age Harvest (HSA)										Total	Flat-flat
	8	11	14	17	20	23	26	29	32	35		
FA 1–1–4–3–6–8–B	2.47	4.08	5.51	5.34	5.97	4.18	5.30	4.64	3.81	3.89	45.19	4.52
FS 3–4–7–1–B	1.97	3.57	5.31	5.08	5.64	5.45	4.99	4.68	3.85	3.52	44.05	4.40
FA 3–2–13–14–B	2.76	4.54	5.38	5.98	6.05	5.47	5.71	5.15	4.39	4.17	49.60	4.96
FA 1–1–5–3–18–B	2.83	4.80	5.65	5.89	5.72	5.03	5.27	4.57	4.30	3.74	47.80	4.78
FA 1–1–10–1–6	2.88	4.12	5.58	6.08	6.05	5.59	5.58	5.19	4.58	4.23	49.88	4.99
FS 3–4–10–3–B	2.29	3.87	5.08	5.26	5.70	5.29	5.34	4.62	4.26	4.00	45.72	4.57
FS 3–4–8–2–B	3.04	3.87	5.19	5.19	5.61	5.32	5.30	4.79	4.44	3.97	46.73	4.67
Fagiola IPB	2.82	4.07	5.29	5.91	5.64	5.36	5.55	5.19	4.33	4.05	48.21	4.82
Aura Green	2.55	3.11	4.62	5.29	5.61	5.46	5.29	5.03	4.22	3.94	45.12	4.51
Total	23.60	36.03	47.61	50.02	52.00	47.15	48.33	43.88	38.18	35.51	422.31	42.23
Average	2.62	4.00	5.29	5.56	5.78	5.24	5.37	4.88	4.24	3.95	46.92	4.69

Attachment 13. (Advanced)

1. Table ANOVA

Source Diversity	Degrees Free	Amount Square	Square Middle	F Count	F Table
Plot Main					
Group (r)	2	0.16	0.08	6.21 *	3.63
Line (g)	8	1.14	0.14	11.39 *	2.59
Error (g)	16	0.20	0.01		
Subplot					
Age Harvest (p)	9	25.78	2.86	148.85 *	1.94
GxP Interaction	72	1.68	0.02	1.21 ns	1.38
Error (p)	162	3.12	0.02		
Total	269	32.07			

Notation * = Significant (F Count > F Table); ns = No significant.

2. Coefficient Diversity

$$KK_{(g)} = \frac{\sqrt{KTE(g)}}{\text{Average Total}} \times 100\% = \frac{\sqrt{0.01}}{15.64} \times 100\% = 7.16\%$$

$$KK_{(p)} = \frac{\sqrt{KTE(p)}}{\text{Average Total}} \times 100\% = \frac{\sqrt{0.02}}{15.64} \times 100\% = 8.87\%$$

3. Variety

Variety Genotype ($\sigma^2 g$) = (KTG –KTE)/r

= (0.14–0.01)/3

= 0.04

Variety Phenotype ($\sigma^2 f$) = $\sigma^2 g$ + KTE

= 0.04 + 0.01

= 0.05

Variety Error = KTE = 0.01

Attachment 13. (Advanced)

4. Heritability

Heritability ($h^2 bs$) $= (\sigma^2 g / \sigma^2 f) \times 100\%$

$= (0.04/0.05) \times 100\%$

$= 80\%$

5. Results Test Carry on Different Real Honest (BNJ) on level 0.05

Test Carry on Different Real Honest (BNJ) on level 0.05

Results Sd (Error (Baku) Line (G) Plant Peanut Long

$Sd = \sqrt{\frac{KTE(g)}{Rp}} = \sqrt{\frac{0.01}{30}} = 0.018$

Mark q–tukey q(α,p,db)

Level real (α) = 0.05

Amount Treatment (G) = 9

Degrees of Error Freedom $_p$ = 16

Tukey q–value $q_{(0.05,9,16)}$ = 5.03

HSD value with real level α HSD

$= q_{(0.05,9,16)} \times Sd$

$= 5.03 \times 0.018$

$= 0.1$

Attachment 13. (Continued)

Table Matrix Character Middle Value Weight Seed Treatment Line (G) Plant Peanut Long

Line	Mark Middle	G5 1.66	G3 1.65	G4 1.61	G7 1.59	G6 1.56	G1 1.52	G8 1.51	G9 1.50	G2 1.47	Notation
G5	1.66	0.00 ns									a
G3	1.65	0.01 ns	0.00 ns								ab
G4	1.61	0.06 ns	0.05 ns	0.00 ns							a B C
G7	1.59	0.07 ns	0.06 ns	0.01 ns	0.00 ns						a B C
G6	1.56	0.11*	0.10 ns	0.05 ns	0.04 ns	0.00 ns					bcd
G1	1.52	0.14*	0.13*	0.08 ns	0.07 ns	0.03 ns	0.00 ns				CD
G8	1.51	0.16*	0.15*	0.10 ns	0.09 ns	0.05 ns	0.02 ns	0.00 ns			CD
G9	1.50	0.16*	0.15*	0.10 ns	0.09 ns	0.05 ns	0.02 ns	0.00 ns	0.00 ns		CD
G2	1.47	0.19*	0.19*	0.14*	0.13*	0.09 ns	0.06 ns	0.04 ns	0.04 ns	0.00 ns	d

G1 = FA 1–1–4–3–6–8–B ; G2 = FS 3–4–7–1–B ; G3 = FA 3–2–13–14–B ; G4 = FA 1–1–5–3–18–B ; G5 = FA 1–1–10–1–6 ; G6 = FS 3–4–10–3– B ; G7 = FS 3–4–8–2–B ; G8 = Fagiola IPB And G9 = Aura Green.

Attachment 13. (Advanced)

Results Sd (Error Standard) Harvest Age (P) Plant Peanut Long

$$Sd_{KTE(p)} = \sqrt{\frac{}{rg}} = \sqrt{\frac{0.02}{27}} = 0.03$$

Mark q–tukey q(α,p,db)

Level real (α) = 0.05

Amount Treatment (G) = 10

Degrees of Error Freedom $_{p}$ = 162

Tukey's q–value $q_{(0.05,10,162)}$ = 4.54

HSD value with real level α HSD

$= q_{(0.05,10,162)} \times Sd$

$= 4.54 \times 0.03$

$= 0.12$

Attachment 13. (Continued)

Table Matrix Mark Middle Character Weight Seed Treatment Age Harvest (P) Plant Peanut Long

Age Harvest	Mark Middle	P5	P4	P7	P3	P6	P8	P9	P2	P10	P1	Notation
		1.93	1.85	1.79	1.76	1.75	1.63	1.41	1.33	1.32	0.87	
P5	1.93	0.00 ns										a
P4	1.85	0.07 ns	0.00 ns									ab
P7	1.79	0.14*	0.06 ns	0.00 ns								b
P3	1.76	0.16*	0.09 ns	0.03 ns	0.00 ns							b
P6	1.75	0.18*	0.11 ns	0.04 ns	0.02 ns	0.00 ns						b
P8	1.63	0.30*	0.23*	0.16*	0.14*	0.12 ns	0.00 ns					c
P9	1.41	0.51*	0.44*	0.38*	0.35*	0.33*	0.21*	0.00 ns				d
P2	1.33	0.59*	0.52*	0.46*	0.43*	0.41*	0.29*	0.08 ns	0.00 ns			d
P10	1.32	0.61*	0.54*	0.47*	0.45*	0.43*	0.31*	0.10 ns	0.02 ns	0.00 ns		d
P1	0.87	1.05*	0.98*	0.92*	0.89*	0.87*	0.75*	0.54*	0.46*	0.44*	0.00 ns	e

P1 = 8 HSA ; P2 = 11 HSA ; P3 = 14 HSA ; P4 = 17 HSA ; P5 = 20 HSA ; P6 = 23 HSA ; P7 = 26 HSA ; P8 = 29 HSA ; P9 = 32 HSA and P10 = 35 HSA.

Attachment 14. Fingerprint Variety Amount Seed Line Hope And Elder Plant Long beans .

No	Line	Age Harvest	Group 1	2	3	Total	Flat - flat
		—(HSA)—	——— (seed) --------				
1	G1	8	17	24	20	61	20.33
		11	17	17	19	53	17.67
		14	21	22	20	63	21.00
		17	13	21	17	51	17.00
		20	22	19	22	63	21.00
		23	20	15	11	46	15.33
		26	18	22	18	58	19.33
		29	16	13	13	42	14.00
		32	20	14	14	48	16.00
		35	15	20	18	53	17.67
	Sub Total		179	187	172	538	
	Average		17.9	18.7	17.2		17.93
2	G2	8	21	20	9	50	16.67
		11	24	17	19	60	20.00
		14	20	20	24	64	21.33
		17	15	22	15	52	17.33
		20	19	17	19	55	18.33
		23	22	20	17	59	19.67
		26	15	18	13	46	15.33
		29	19	14	16	49	16.33
		32	14	15	15	44	14.67
		35	13	17	18	48	16.00
	Sub Total		182	180	165	527	
	Average		18.2	18	16.5		17.57
3	G3	8	24	23	17	64	21.33
		11	19	19	20	58	19.33
		14	21	22	17	60	20.00
		17	19	22	18	59	19.67
		20	22	19	19	60	20.00
		23	22	26	15	63	21.00
		26	19	14	23	56	18.67
		29	19	17	19	55	18.33
		32	16	21	21	58	19.33
		35	20	21	19	60	20.00
	Sub Total		201	204	188	593	
	Average		20.1	20.4	18.8		19.77

Attachment 14. (Advanced)

4	G4	8	21	20	20	61	20.33
		11	22	18	9	49	16.33
		14	23	23	18	64	21.33
		17	21	20	20	61	20.33
		20	19	21	19	59	19.67
		23	20	16	19	55	18.33
		26	21	17	25	63	21.00
		29	18	15	18	51	17.00
		32	20	15	20	55	18.33
		35	18	22	19	59	19.67
	Sub Total		203	187	187	577	
	Average		20.3	18.7	18.7		19.23
5	G5	8	25	15	19	59	19.67
		11	21	23	17	61	20.33
		14	21	16	21	58	19.33
		17	21	21	20	62	20.67
		20	21	18	21	60	20.00
		23	20	27	21	68	22.67
		26	20	16	18	54	18.00
		29	23	13	16	52	17.33
		32	21	20	19	60	20.00
		35	21	20	19	60	20.00
	Sub Total		214	189	191	594	
	Average		21.4	18.9	19.1		19.8
6	G6	8	22	13	19	54	18.00
		11	19	20	20	59	19.67
		14	22	21	19	62	20.67
		17	21	12	22	55	18.33
		20	19	20	19	58	19.33
		23	21	14	18	53	17.67
		26	20	14	14	48	16.00
		29	17	15	16	48	16.00
		32	23	19	21	63	21.00
		35	20	15	18	53	17.67
	Sub Total		204	163	186	553	
	Average		20.4	16.3	18.6		18.43
7	G7	8	22	19	22	63	21.00
		11	24	21	21	66	22.00
		14	19	18	19	56	18.67
		17	12	16	19	47	15.67

Attachment 14. (Advanced)

		20	21	23	15	59	19.67
		23	21	21	19	61	20.33
		26	19	20	16	55	18.33
		29	19	14	18	51	17.00
		32	20	16	20	56	18.67
		35	17	20	17	54	18.00
	Sub Total		194	188	186	568	
	Average		19.4	18.8	18.6		18.93
8	G8	8	24	24	17	65	21.67
	(Fagiola	11	17	20	19	56	18.67
	IPB)	14	15	22	16	53	17.67
		17	18	19	19	56	18.67
		20	19	15	20	54	18.00
		23	19	22	19	60	20.00
		26	18	20	18	56	18.67
		29	19	19	19	57	19.00
		32	20	19	19	58	19.33
		35	19	19	20	58	19.33
	Sub Total		188	199	186	573	
	Average		18.8	19.9	18.6		19.10
9	G9	8	19	22	16	57	19.00
	(Aura Green)	11	21	22	21	64	21.33
		14	20	19	22	61	20.33
		17	20	18	19	57	19.00
		20	18	18	17	53	17.67
		23	18	21	21	60	20.00
		26	19	15	18	52	17.33
		29	14	13	19	46	15.33
		32	22	17	20	59	19.67
		35	15	22	18	55	18.33
	Sub Total		186	187	191	564	
	Average		18.6	18.7	19.1		18.8
Total			1751	1684	1652	5087	
Flat -flat			19.46	18.71	18.36		18.84

G1 = FA 1–1–4–3–6–8–B ; G2 = FS 3–4–7–1–B ; G3 = FA 3–2–13–14–B ; G4 = FA 1–1–5–3–18–B ; G5 = FA 1–1–10–1–6 ; G6 = FS 3–4–10–3–B ; G7 = FS 3–4–8–2–B ; G8 = Fagiola IPB And G9 = Aura Green.

Attachment 14. (Advanced)

Table Plot Main

Line	Group			Total	Average
	1	2	3		
FA 1–1–4–3–6–8–B	179	187	172	538	179.33
FS 3–4–7–1–B	182	180	165	527	175.67
FA 3–2–13–14–B	201	204	188	593	197.67
FA 1–1–5–3–18–B	203	187	187	577	192.33
FA 1–1–10–1–6	214	189	191	594	198.00
FS 3–4–10–3–B	204	163	186	553	184.33
FS 3–4–8–2–B	194	188	186	568	189.33
Fagiola IPB	188	199	186	573	191.00
Aura Green	186	187	191	564	188.00
Total	1751	1684	1652	5087	
Average	194.56	187.11	183.56		188.41

Attachment 14. (Attachment)

Table Child Plot

Line	Age Harvest (HSA)										Total	Aver age
	8	11	14	17	20	23	26	29	32	35		
G1	61	53	63	51	63	46	58	42	48	53	538	53.80
G2	50	60	64	52	55	59	46	49	44	48	527	52.70
G3	64	58	60	59	60	63	56	55	58	60	593	59.30
G4	61	49	64	61	59	55	63	51	55	59	577	57.70
G5	59	61	58	62	60	68	54	52	60	60	594	59.40
G6	54	59	62	55	58	53	48	48	63	53	553	55.30
G7	63	66	56	47	59	61	55	51	56	54	568	56.80
G8	65	56	53	56	54	60	56	57	58	58	573	57.30
G9	57	64	61	57	53	60	52	46	59	55	564	56.40
Total	534	526	54 1	500	521	525	488	451	501	500	5087	
	59.33	58.44	60.11	55.56	57.89	58.33	54.22	50.11	55.67	55.56	565.22	56.52

P1 = 8 HSA ; P2 = 11 HSA ; P3 = 14 HSA ; P4 = 17 HSA ; P5 = 20 HSA ; P6 = 23 HSA ; P7 = 26 HSA ; P8 = 29 HSA ; P9 = 32 HSA and P10 = 35 HSA

Attachment 14. (Advanced)

1. Table ANOVA

Source Diversity	Degrees Free	Amount Square	Square Middle	F Count	F Table
Plot Main					
Group (r)	2	56.72	28.36	3.22 ^{ns}	3.63
Line (g)	8	138.65	17.33	1.97 ^{ns}	2.59
Error $_{(g)}$	16	141.08	8.82		
Subplot					
Age Harvest (p)	9	235.86	26.21	3.51 *	1.94
GxP Interaction	72	502.31	6.98	0.93 ^{ns}	1.38
Error $_{(p)}$	162	1209.53	7,4663		
Total	269	2284.15			

Notation * = Significant (F Count > F Table)

2. Coefficient Diversity

$$KK_{(g)} = \frac{\sqrt{KTE(g)}}{\text{Average Total}} \times 100\% = \frac{\sqrt{8.82}}{18.84} \times 100\% = 15.76\%$$

$$KK_{(p)} = \frac{\sqrt{KTE(p)}}{\text{Average Total}} \times 100\% = \frac{\sqrt{7.74}}{18.84} \times 100\% = 14.50\%$$

3. Variety

Variety Genotype ($\sigma^2 g$) = (KTG –KTE)/r

= (17.33 –8.82)/3

= 2.84

Variety Phenotype ($\sigma^2 f$) = $\sigma^2 g$ + KTE

= 2.84 + 8.82

= 11.66

Variety Error = KTE = 8.82

Attachment 14. (Advanced)

4. Heritability

Heritability ($h^2 bs$) $= (\sigma^2 g / \sigma^2 f) \times 100\%$

$= (2.84/11.66) \times 100\%$

$= 24.36\%$

5. Results Test Carry on Different Real Honest (BNJ) on level 0.05

Test Carry on Different Real Honest (BNJ) on level 0.05

Results Sd (Error Standard) Harvest Age (P) Plant Peanut Long

$Sd = \sqrt{\frac{KTE(p)}{rg}} = \sqrt{\frac{7.47}{27}} = 0.53$

Mark q–tukey q(α,p,db)

Level real (α) = 0.05

Amount Treatment (G) = 10

Degrees of Error Freedom $_p$ = 162

Tukey's q–value $q_{(0.05,10,162)}$ = 4.54

HSD value with real level α HSD

$= q_{(0.05,10,162)} \times Sd$

$= 4.54 \times 0.53$

$= 2.41$

Attachment 14. (Continued)

Table Matrix Mark Middle Character Amount Seed Treatment Harvest Age (P) Plant Peanut Long

Age Harvest	Mark Middle	P3	P1	P2	P6	P5	P9	P4	P10	P7	P8	Notation
		20.04	19.78	19.48	19.44	19.30	18.56	18.52	18.52	18.07	16.70	
P3	20.04	0.00 ns										a
P1	19.78	0.26 ns	0.00 ns									a
P2	19.48	0.56 ns	0.30 ns	0.00 ns								a
P6	19.44	0.59 ns	0.33 ns	0.04 ns	0.00 ns							a
P5	19.30	0.74 ns	0.48 ns	0.19 ns	0.15 ns	0.00 ns						a
P9	18.56	1.48 ns	1.22 ns	0.93 ns	0.89 ns	0.74 ns	0.00 ns					ab
P4	18.52	1.52 ns	1.26 ns	0.96 ns	0.93 ns	0.78 ns	0.04 ns	0.00 ns				ab
P10	18.52	1.52 ns	1.26 ns	0.96 ns	0.93 ns	0.78 ns	0.04 ns	0.00 ns	0.00 ns			ab
P7	18.07	1.96 ns	1.70 ns	1.41 ns	1.37 ns	1.22 ns	0.48 ns	0.44 ns	0.44 ns	0.00 ns		ab
P8	16.70	3.33*	3.07*	2.78*	2.74*	2.59*	1.85 ns	1.81 ns	1.81 ns	1.37 ns	0.00 ns	b

P1 = 8 HSA ; P2 = 11 HSA ; P3 = 14 HSA ; P4 = 17 HSA ; P5 = 20 HSA ; P6 = 23 HSA ; P7 = 26 HSA ; P8 = 29 HSA ; P9 = 32 HSA and P10 = 35 HSA

Attachment 15. Fingerprint Variety Level Water Seed Line Hope And Elder Long Bean Plants

No	Line	Age Harvest	Group 1	Group 2	Group 3	Total	Flat - flat
		–(HSA)–		(%)			
1	G1	8	62.94	51.24	60.56	174.73	58.24
		11	51.83	42.34	56.86	151.03	50.34
		14	37.96	31.40	38.86	108.21	36.07
		17	20.81	28.21	26.51	75.53	25.18
		20	11.81	16.44	18.85	47.10	15.70
		23	11.53	11.52	11.78	34.82	11.61
		26	11.24	11.32	11.28	33.84	11.28
		29	10.70	11.13	10.80	32.63	10.88
		32	10.40	10.00	10.68	31.08	10.36
		35	10.39	8.70	10.26	29.34	9.78
	Sub Total		239.60	222.29	256.42	718.31	
	Average		23.96	22.23	25.64		23.94
2	G2	8	68.16	63.89	60.23	192.28	64.09
		11	45.83	60.19	43.73	149.75	49.92
		14	35.53	33.86	34.87	104.26	34.75
		17	28.65	25.59	29.27	83.51	27.84
		20	11.54	18.22	19.57	49.32	16.44
		23	11.37	11.46	11.89	34.72	11.57
		26	11.23	11.30	11.52	34.05	11.35
		29	11.17	11.26	11.42	33.85	11.28
		32	10.53	10.80	9.35	30.67	10.22
		35	10.45	10.12	9.30	29.86	9.95
	Sub Total		244.45	256.68	241.14	742.28	
	Average		24.45	25.67	24.11		24.74
3	G3	8	65.73	61.16	54.26	181.15	60.38
		11	62.65	50.12	39.76	152.53	50.84
		14	30.11	27.90	34.38	92.39	30.80
		17	21.65	23.33	18.76	63.75	21.25
		20	11.75	18.99	18.41	49.16	16.39
		23	11.25	11.97	11.92	35.15	11.72
		26	11.09	11.78	11.58	34.45	11.48
		29	10.61	11.62	11.57	33.79	11.26
		32	9.94	11.18	9.56	30.68	10.23
		35	7.43	11.26	8.41	27.10	9.03
	Sub Total		242.22	239.30	218.62	700.14	
	Average		24.22	23.93	21.86		23.34

Attachment 15.(Continued)

4	G4	8	69.43	68.31	72.46	210.21	70.07
		11	51.04	55.89	59.92	166.86	55.62
		14	40.67	34.31	45.40	120.38	40.13
		17	27.61	29.25	13.03	69.89	23.30
		20	11.82	17.97	12.06	41.86	13.95
		23	11.35	11.67	11.89	34.91	11.64
		26	11.15	11.49	11.31	33.96	11.32
		29	10.68	11.28	11.03	32.98	10.99
		32	7.09	8.53	9.48	25.10	8.37
		35	6.16	6.26	8.38	20.81	6.94
	Sub Total		247.00	254.98	254.97	756.94	
	Average		24.70	25.50	25.50		25.23
5	G5	8	57.93	63.91	78.36	200.21	66.74
		11	53.79	55.02	43.85	152.66	50.89
		14	30.43	31.94	37.89	100.26	33.42
		17	12.48	23.84	33.27	69.59	23.20
		20	11.57	15.72	18.82	46.11	15.37
		23	11.32	11.28	11.72	34.32	11.44
		26	11.13	11.07	11.55	33.75	11.25
		29	11.09	10.92	11.34	33.35	11.12
		32	11.05	8.99	10.23	30.27	10.09
		35	10.48	7.87	8.48	26.83	8.94
	Sub Total		221.27	240.55	265.51	727.34	
	Average		22.13	24.06	26.55		24,244
6	G6	8	73.93	65.91	78.36	218.20	72.73
		11	66.48	55.56	43.85	165.89	55.30
		14	32.34	35.52	37.89	105.74	35.25
		17	27.72	28.63	33.27	89.62	29.87
		20	11.29	14.62	18.82	44.74	14.91
		23	11.18	11.15	11.72	34.05	11.35
		26	11.11	11.05	11.55	33.70	11.23
		29	11.05	10.56	11.34	32.95	10.98
		32	10.97	10.43	10.23	31.63	10.54
		35	13.14	10.07	8.48	31.69	10.56
	Sub Total		269.20	253.49	265.51	788.19	
	Average		26.92	25.35	26.55		26.27
7	G7	8	65.42	69.23	64.52	199.16	66.39
		11	58.29	53.07	45.16	156.52	52.17
		14	30.62	36.70	34.36	101.67	33.89
		17	22.72	33.72	20.38	76.82	25.61
		20	11.40	14.40	15.71	41.50	13.83

Attachment 15. (Advanced)

		23	11.33	11.20	11.74	34.27	11.42
		26	11.11	11.11	11.32	33.54	11.18
		29	11.05	10.58	10.36	31.98	10.66
		32	10.69	10.23	9.07	30.00	10.00
		35	10.64	9.96	8.47	29.07	9.69
	Sub Total		243.27	260.19	231.08	734.54	
	Average		24.33	26.02	23.11	73.45	24.48
8	G8	8	67.19	69.90	76.75	213.84	71.28
	(Fagiola	11	54.53	58.13	58.33	170.98	56.99
	IPB)	14	32.94	38.75	44.21	115.90	38.63
		17	29.47	25.35	24.66	79.47	26.49
		20	11.05	17.78	11.52	40.35	13.45
		23	10.85	11.84	10.98	33.68	11.23
		26	10.67	11.39	9.53	31.59	10.53
		29	10.10	11.19	8.96	30.25	10.08
		32	10.09	10.82	8.11	29.01	9.67
		35	9.98	10.31	7.56	27.85	9.28
	Sub Total		246.85	265.45	260.62	772.92	
	Average		24.68	26.54	26.06		25.76
9	G9	8	60.06	61.33	60.00	181.40	60.47
	(Aura	11	50.48	46.97	40.74	138.19	46.06
	Green)	14	37.98	37.45	38.36	113.79	37.93
		17	24.90	34.88	25.44	85.22	28.41
		20	15.19	20.27	17.15	52.61	17.54
		23	12.96	14.91	14.40	42.26	14.09
		26	11.46	12.43	13.40	37.29	12.43
		29	10.70	11.62	11.28	33.60	11.20
		32	10.56	10.99	11.15	32.70	10.90
		35	10.03	9.44	9.85	29.32	9.77
	Sub Total		244.32	260.30	241.77	746.38	
	Average		24.43	26.03	24.18	74.64	24.88
Total			2198.17	2253.22	2235.64	6687.03	
Flat -flat			24.42	25.04	24.84		124.18

G1 = FA 1–1–4–3–6–8–B ; G2 = FS 3–4–7–1–B ; G3 = FA 3–2–13–14–B ; G4 = FA 1–1–5–3–18–B ; G5 = FA 1–1–10–1–6 ; G6 = FS 3–4–10–3–B ; G7 = FS 3–4–8–2–B ; G8 = Fagiola IPB And G9 = Aura Green.

Attachment 15. (Advanced)

Table Plot Main

Line	Group			Total	Flat-flat
	1	2	3		
FA 1–1–4–3–6–8–B	239.60	222.29	256.42	718.31	239.44
FS 3–4–7–1–B	244.45	256.68	241.14	742.28	247.43
FA 3–2–13–14–B	242.22	239.30	218.62	700.14	233.38
FA 1–1–5–3–18–B	247.00	254.98	254.97	756.94	252.31
FA 1–1–10–1–6	221.27	240.55	265.51	727.34	242.45
FS 3–4–10–3–B	269.20	253.49	265.51	788.19	262.73
FS 3–4–8–2–B	243.27	260.19	231.08	734.54	244.85
Fagiola IPB	246.85	265.45	260.62	772.92	257.64
Aura Green	244.32	260.30	241.77	746.38	248.79
Total	2198.17	2253.22	2235.64	6687.03	2229.01
Average	244.24	250.36	248.40	743.00	247.67

Attachment 15. (Advanced)

Table Child Plot

Line	Age Harvest (HSA)										Total	Average
	8	11	14	17	20	23	26	29	32	35		
FA 1–1–4–3–6–8–B	174.73	151.03	108.21	75.53	47.10	34.82	33.84	32.63	31.08	29.34	718.31	71.83
FS 3–4–7–1–B	192.28	149.75	104.26	83.51	49.32	34.72	34.05	33.85	30.67	29.86	742.28	74.23
FA 3–2–13–14–B	181.15	152.53	92.39	63.75	49.16	35.15	34.45	33.79	30.68	27.10	700.14	70.01
FA 1–1–5–3–18–B	210.21	166.86	120.38	69.89	41.86	34.91	33.96	32.98	25.10	20.81	756.94	75.69
FA 1–1–10–1–6	200.21	152.66	100.26	69.59	46.11	34.32	33.75	33.35	30.27	26.83	727.34	72.73
FS 3–4–10–3–B	218.20	165.89	105.74	89.62	44.74	34.05	33.70	32.95	31.63	31.69	788.19	78.82
FS 3–4–8–2–B	199.16	156.52	101.67	76.82	41.50	34.27	33.54	31.98	30.00	29.07	734.54	73.45
Fagiola IPB	213.84	170.98	115.90	79.47	40.35	33.68	31.59	30.25	29.01	27.85	772.92	77.29
Green Aura	181.40	138.19	113.79	85.22	52.61	42.26	37.29	33.60	32.70	29.32	746.38	74.64
Total	1771.17	1404.39	962.60	693.39	412.75	318.17	306.16	295.38	271.14	251.87	6687.03	668.70
Average	196.80	156.04	106.96	77.04	45.86	35.35	34.02	32.82	30.13	27.99		74.30

Attachment 15. (Advanced)

1. Table ANOVA

Source Diversity	Degrees Free	Amount Square	Square Middle	F Count	F Table
Plot Main					
Group (r)	2	19.77	9.89	0.60 ^{ns}	3.63
Line (g)	8	194.29	24.29	1.48 ^{ns}	2.59
Error $_{(g)}$	16	261.78	16.36		
Subplot					
Age Harvest (p)	9	9760.34	10844.59	722.92 *	1.94
GxP Interaction	72	1258.03	17.47	1.16 ^{ns}	1.38
Error $_{(p)}$	162	2430.16	15.00		
Total	269	101765.37			

Notation * = Significant (F Count > F Table); ns = No significant

2. Coefficient Diversity

$$KK_{(g)} = \frac{\sqrt{KTE(g)}}{\text{Average Total}} \times 100\% = \frac{\sqrt{16.36}}{124.18} \times 100\% = 16.31\%$$

$$KK_{(p)} = \frac{\sqrt{KTE(p)}}{\text{Average Total}} \times 100\% = \frac{\sqrt{15.00}}{124.18} \times 100\% = 15.61\%$$

3. Variety

Variety Genotype ($\sigma^2 g$) = (KTG –KTE)/r

= (24.29–16.36)/3

= 2.64

Variety Phenotype ($\sigma^2 f$) = $\sigma^2 g$ + KTE

= 2.64 + 16.36

= 19

Variety Error = KTE = 16.36

Attachment 15. (Advanced)

4. Heritability

Heritability (h^2 bs) $= (\sigma^2 g / \sigma^2 f) \times 100\%$

$= (2.64/19) \times 100\%$

$= 13.89\%$

5. Results Test Carry on Different Real Honest (BNJ) on level 0.05

Results Sd (Error Standard) Harvest Age (P) Plant Peanut Long

$Sd = \sqrt{\frac{KTE(p)}{rg}} = \sqrt{\frac{15.00}{27}} = 0.75$

Q–Tukey value q(α,p,db)

Real level (α) = 0.05

Number of Treatments (P) =

10 Degrees of Error Free $_p$

= 162

Q–Tukey q value $_{(0.05,10,162)}$ = 4.54

HSD value with real level α HSD

$= q_{(0.05,10,162)} \times Sd$

$= 4.54 \times 0.75$

$= 3.41$

Attachment 15. (Advanced)

Table Matrix Mark Middle Character Level Water Treatment Age Harvest (P) Bean Plants Long

Harvest Age	Middle Value	P1	P2	P3	P7	P4	P5	P6	P8	P9	P10	Notation
		65.60	52.01	35.65	25.68	15.29	11.78	11.34	10.94	10.04	9.33	
P1	65.60	0.00 ^{ns}										a
P2	52.01	13.58*	0.00 ^{ns}									b
P3	35.65	29.95*	16.36*	0.00 ^{ns}								c
P7	25.68	39.92*	26.33*	9.97*	0.00 ^{ns}							d
P4	15.29	50.31*	36.73*	20.36*	10.39*	0.00 ^{ns}						e
P5	11.78	53.81*	40.23*	23.87*	13.90*	3.50*	0.00 ^{ns}					f
P6	11.34	54.26*	40.67*	24.31*	14.34*	3.95*	0.44 ^{ns}	0.00 ^{ns}				f
P8	10.94	54.66*	41.07*	24.71*	14.74*	4.35*	0.84 ^{ns}	0.40 ^{ns}	0.00 ^{ns}			f
P9	10.04	55.56*	41.97*	25.61*	15.64*	5.24*	1.74 ^{ns}	1.30 ^{ns}	0.90 ^{ns}	0.00 ^{ns}		f
P10	9.33	46.23*	42.69*	26.32*	16.35*	5.96*	2.46 ^{ns}	2.01 ^{ns}	1.61 ^{ns}	0.71 ^{ns}	0.00 ^{ns}	f

P1 = 8 HSA ; P2 = 11 HSA ; P3 = 14 HSA ; P4 = 17 HSA ; P5 = 20 HSA ; P6 = 23 HSA ; P7 = 26 HSA ; P8 = 29 HSA ; P9 = 32 HSA and P10 = 35 HSA.

Attachment 16. Fingerprint Variety Power Germinate Line Hope And Elder Long Bean Plants.

No st	Line	Age Harve	Average 1	2	Total 3	Group	– flat
		–(HSA)–	——— (%) ———				
1	G1	8	0.00	0.00	0.00	0.00	0.00
		11	0.00	0.00	0.00	0.00	0.00
		14	20.00	35.00	15.00	70.00	23.33
		17	65.00	75.00	25.00	165.00	55.00
		20	75.00	85.00	60.00	220.00	73.33
		23	80.00	50.00	70.00	200.00	66.67
		26	45.00	75.00	45.00	165.00	55.00
		29	35.00	15.00	15.00	65.00	21.67
		32	10.00	0.00	0.00	10.00	3.33
		35	0.00	0.00	0.00	0.00	0.00
	Sub Total		330.00	335.00	230.00	895.00	
	Average		33.00	33.50	23.00		29.83
2	G2	8	0.00	0.00	0.00	0.00	0.00
		11	0.00	0.00	0.00	0.00	0.00
		14	0.00	35.00	0.00	35.00	11.67
		17	20.00	60.00	50.00	130.00	43.33
		20	40.00	75.00	65.00	180.00	60.00
		23	90.00	35.00	60.00	185.00	61.67
		26	10.00	15.00	25.00	50.00	16.67
		29	5.00	0.00	10.00	15.00	5.00
		32	0.00	0.00	5.00	5.00	1.67
		35	0.00	0.00	0.00	0.00	0.00
	Sub Total		165.00	220.00	215.00	600.00	
	Average		16.50	22.00	21.50		20.00
3	G3	8	0.00	0.00	0.00	0.00	0.00
		11	0.00	0.00	0.00	0.00	0.00
		14	20.00	40.00	25.00	85.00	28.33
		17	20.00	55.00	25.00	100.00	33.33
		20	65.00	85.00	40.00	190.00	63.33
		23	65.00	50.00	50.00	165.00	55.00
		26	50.00	55.00	50.00	155.00	51.67
		29	40.00	45.00	75.00	160.00	53.33
		32	0.00	20.00	5.00	25.00	8.33
		35	0.00	0.00	0.00	0.00	0.00
	Sub Total		260.00	350.00	270.00	880.00	
	Average		26.00	35.00	27.00		29.33
4	G4	8	0.00	0.00	0.00	0.00	0.00
		11	0.00	0.00	0.00	0.00	0.00
		14	5.00	20.00	5.00	30.00	10.00

Attachment 16. (Advanced)

		17	5.00	25.00	0.00	30.00	10.00
		20	65.00	60.00	10.00	135.00	45.00
		23	55.00	50.00	40.00	145.00	48.33
		26	55.00	45.00	55.00	155.00	51.67
		29	45.00	15.00	15.00	75.00	25.00
		32	75.00	5.00	5.00	85.00	28.33
		35	0.00	0.00	0.00	0.00	0.00
	Sub Total		305.00	220.00	130.00	655.00	
	Average		30.50	22.00	13.00		21.83
5	G5	8	0.00	0.00	0.00	0.00	0.00
		11	0.00	0.00	0.00	0.00	0.00
		14	5.00	15.00	15.00	35.00	11.67
		17	15.00	60.00	45.00	120.00	40.00
		20	50.00	70.00	70.00	190.00	63.33
		23	65.00	35.00	25.00	125.00	41.67
		26	5.00	35.00	0.00	40.00	13.33
		29	50.00	30.00	40.00	120.00	40.00
		32	80.00	20.00	15.00	115.00	38.33
		35	0.00	0.00	10.00	10.00	3.33
	Sub Total		270.00	265.00	220.00	755.00	
	Average		27.00	26.50	22.00		25.17
6	G6	8	0.00	0.00	0.00	0.00	0.00
		11	5.00	0.00	0.00	5.00	1.67
		14	10.00	25.00	10.00	45.00	15.00
		17	15.00	30.00	20.00	65.00	21.67
		20	65.00	50.00	85.00	200.00	66.67
		23	25.00	80.00	50.00	155.00	51.67
		26	0.00	15.00	30.00	45.00	15.00
		29	15.00	0.00	10.00	25.00	8.33
		32	15.00	0.00	0.00	15.00	5.00
		35	0.00	0.00	0.00	0.00	0.00
	Sub Total		150.00	200.00	205.00	555.00	
	Average		15.00	20.00	20.50		18.50
7	G7	8	0.00	0.00	0.00	0.00	0.00
		11	0.00	0.00	0.00	0.00	0.00
		14	35.00	25.00	25.00	85.00	28.33
		17	35.00	45.00	15.00	95.00	31.67
		20	85.00	65.00	50.00	200.00	66.67
		23	5.00	55.00	90.00	150.00	50.00
		26	0.00	55.00	20.00	75.00	25.00
		29	30.00	40.00	5.00	75.00	25.00
		32	50.00	25.00	0.00	75.00	25.00
		35	35.00	0.00	0.00	35.00	11.67

Attachment 16.(Continued)

	Sub Total		275.00	310.00	205.00	790.00	
	Average		27.50	31.00	20.50		26.33
8	G8	8	0.00	0.00	0.00	0.00	0.00
	(Fagiola	11	0.00	0.00	0.00	0.00	0.00
	IPB)	14	35.00	20.00	45.00	100.00	33.33
		17	60.00	15.00	40.00	115.00	38.33
		20	50.00	70.00	30.00	150.00	50.00
		23	65.00	50.00	75.00	190.00	63.33
		26	55.00	45.00	40.00	140.00	46.67
		29	50.00	15.00	30.00	95.00	31.67
		32	50.00	10.00	30.00	90.00	30.00
		35	20.00	0.00	0.00	20.00	6.67
	Sub Total		385.00	225.00	290.00	900.00	
	Average		38.50	22.50	29.00		30.00
9	G9	8	0.00	0.00	0.00	0.00	0.00
	(Aura	11	0.00	0.00	0.00	0.00	0.00
	Green)	14	0.00	15.00	0.00	15.00	5.00
		17	55.00	35.00	20.00	110.00	36.67
		20	60.00	40.00	50.00	150.00	50.00
		23	25.00	50.00	50.00	125.00	41.67
		26	45.00	75.00	60.00	180.00	60.00
		29	15.00	50.00	85.00	150.00	50.00
		32	25.00	0.00	15.00	40.00	13.33
		35	0.00	0.00	0.00	0.00	0.00
	Sub Total		225.00	265.00	280.00	770.00	
	Average		22.50	26.50	28.00		25.67
Total			2365.00	2390.00	2045.00	6800.00	
Flat -flat			26.28	26.56	22.72		25.19

G1 = FA 1–1–4–3–6–8–B ; G2 = FS 3–4–7–1–B ; G3 = FA 3–2–13–14–B ; G4 = FA 1–1–5–3–18–B ; G5 = FA 1–1–10–1–6 ; G6 = FS 3–4–10–3–B ; G7 = FS 3–4–8–2–B ; G8 = Fagiola IPB And G9 = Aura Green.

Attachment 16. (Advanced)

Table Plot Main

Line	Group			Total	Average
	1	2	3		
FA 1–1–4–3–6–8–B	330	335	230	895	298.33
FS 3–4–7–1–B	165	220	215	600	200.00
FA 3–2–13–14–B	260	350	270	880	293.33
FA 1–1–5–3–18–B	305	220	130	655	218.33
FA 1–1–10–1–6	270	265	220	755	251.67
FS 3–4–10–3–B	150	200	205	555	185.00
FS 3–4–8–2–B	275	310	205	790	263.33
Fagiola IPB	385	225	290	900	300.00
Aura Green	225	265	280	770	256.67
Total	2365	2390	2045	6800	2266.67
Average	262.78	265.56	27.22	755.56	251.85

Attachment 16. (Advanced)

Table Child Plot

Line	Age Harvest (HSA)										Total	Average
	8	11	14	17	20	23	26	29	32	35		
FA 1–1–4–3–6–8–B	0	0	70	165	220	200	165	65	10	0	895	89.50
FS 3–4–7–1–B	0	0	35	130	180	185	50	15	5	0	600	60.00
FA 3–2–13–14–B	0	0	85	100	190	165	155	160	25	0	880	88.00
FA 1–1–5–3–18–B	0	0	30	30	135	145	155	75	85	0	655	65.50
FA 1–1–10–1–6	0	0	35	120	190	125	40	120	115	10	755	75.50
FS 3–4–10–3–B	0	5	45	65	200	155	45	25	15	0	555	55.50
FS 3–4–8–2–B	0	0	85	95	200	150	75	75	75	35	790	79.00
Fagiola IPB	0	0	100	115	150	190	140	95	90	20	900	90.00
Green Aura	0	0	15	110	150	125	180	150	40	0	770	77.00
Total	0	5	500	930	1615	1440	1005	780	460	65	6800	680.00
Average	0.00	0.56	55.56	103.33	179.44	160.00	111.67	86.67	51.11	7.22	755.56	75.56

Attachment 16. (Advanced)

1. Table ANOVA

Source Diversity	Degrees Free	Amount Square	Square Middle	F Count	F Table
Plot Main					
Group (r)	2	822.41	411.20	1.48 ^{ns}	3.63
Line (g)	8	4390.74	548,848	1.97 ^{ns}	2.59
Error $_{(g)}$	16	4447.59	277.97		
Subplot					
Age Harvest (p)	9	111370.37	12374.49	52.14 *	1.94
GxP Interaction	72	2661.96	369.62	1.56 *	1.38
Error $_{(p)}$	162	38446.67	237.33		
Total	269	186090.74			

Notation * = Significant (F Count > F Table); ns = No significant

2. Coefficient Diversity

$$KK_{(g)} = \frac{\sqrt{KTE(g)}}{\text{Average Total}} \times 100\% = \frac{\sqrt{277.97}}{25.19} \times 100\% = 66.20\%$$

$$KK_{(p)} = \frac{\sqrt{KTE(p)}}{\text{Average Total}} \times 100\% = \frac{\sqrt{237.33}}{25.19} \times 100\% = 61.17\%$$

Mark coefficient diversity >50%, transformation data use $\sqrt[3]{\overline{(x+10)}}$

Attachment 16. (Advanced)

Results Transformation Power Power Germinate Plant Peanut Long.

No	Line	Age Harvest	Group 1	2	3	Total	Flat-flat
		–(HSA)–		——————%——————			
1	G1	8	2.15	2.15	2.15	6.46	2.15
		11	2.15	2.15	2.15	6.46	2.15
		14	3.11	3.56	2.92	9.59	3.20
		17	4.22	4.40	3.27	11.89	3.96
		20	4.40	4.56	4.12	13.08	4.36
		23	4.48	3.91	4.31	12.71	4.24
		26	3.80	4.40	3.80	12.00	4.00
		29	3.56	2.92	2.92	9.40	3.13
		32	2.71	2.15	2.15	7.02	2.34
		35	2.15	2.15	2.15	6.46	2.15
	Sub Total		32.74	32.37	29.97	95.08	
	Average		3.27	3.24	3.00		3.17
2	G2	8	2.15	2.15	2.15	6.46	2.15
		11	2.15	2.15	2.15	6.46	2.15
		14	2.15	3.56	2.15	7.87	2.62
		17	3.11	4.12	3.91	11.14	3.71
		20	3.68	4.40	4.22	12.30	4.10
		23	4.64	3.56	4.12	12.32	4.11
		26	2.71	2.92	3.27	8.91	2.97
		29	2.47	2.15	2.71	7.34	2.45
		32	2.15	2.15	2.47	6.78	2.26
		35	2.15	2.15	2.15	6.46	2.15
	Sub Total		27.39	29.33	29.32	86.04	
	Average		2.74	2.93	2.93		2.87
3	G3	8	2.15	2.15	2.15	6.46	2.15
		11	2.15	2.15	2.15	6.46	2.15
		14	3.11	3.68	3.27	10.06	3.35
		17	3.11	4.02	3.27	10.40	3.47
		20	4.22	4.56	3.68	12.46	4.15
		23	4.22	3.91	3.91	12.05	4.02
		26	3.91	4.02	3.91	11.85	3.95
		29	3.68	3.80	4.40	11.88	3.96
		32	2.15	3.11	2.47	7.73	2.58
		35	2.15	2.15	2.15	6.46	2.15
	Sub Total		30.87	33.58	31.38	95.82	
	Average		3.09	3.36	3.14		3.19

Attachment 16. (Advanced)

4	G4	8	2.15	2.15	2.15	6.46	2.15
		11	2.15	2.15	2.15	6.46	2.15
		14	2.47	3.11	2.47	8.04	2.68
		17	2.47	3.27	2.15	7.89	2.63
		20	4.22	4.12	2.71	11.05	3.68
		23	4.02	3.91	3.68	11.62	3.87
		26	4.02	3.80	4.02	11.84	3.95
		29	3.80	2.92	2.92	9.65	3.22
		32	4.40	2.47	2.47	9.33	3.11
		35	2.15	2.15	2.15	6.46	2.15
	Sub Total		31.85	30.07	26.89	88.82	
	Average		3.19	3.01	2.69		2.96
5	G5	8	2.15	2.15	2.15	6.46	2.15
		11	2.15	2.15	2.15	6.46	2.15
		14	2.47	2.92	2.92	8.31	2.77
		17	2.92	4.12	3.80	10.85	3.62
		20	3.91	4.31	4.31	12.53	4.18
		23	4.22	3.56	3.27	11.05	3.68
		26	2.47	3.56	2.15	8.18	2.73
		29	3.91	3.42	3.68	11.02	3.67
		32	4.48	3.11	2.92	10.51	3.50
		35	2.15	2.15	2.71	7.02	2.34
	Sub Total		30.85	31.46	30.09	92.40	
	Average		3.08	3.15	3.01		3.08
6	G6	8	2.15	2.15	2.15	6.46	2.15
		11	2.47	2.15	2.15	6.78	2.26
		14	2.71	3.27	2.71	8.70	2.90
		17	2.92	3.42	3.11	9.45	3.15
		20	4.22	3.91	4.56	12.69	4.23
		23	3.27	4.48	3.91	11.67	3.89
		26	2.15	2.92	3.42	8.50	2.83
		29	2.92	2.15	2.71	7.79	2.60
		32	2.92	2.15	2.15	7.23	2.41
		35	2.15	2.15	2.15	6.46	2.15
	Sub Total		27.90	28.78	29.05	85.74	
	Average		2.79	2.88	2.91		2.86
7	G7	8	2.15	2.15	2.15	6.46	2.15
		11	2.15	2.15	2.15	6.46	2.15
		14	3.56	3.27	3.27	10.10	3.37
		17	3.56	3.80	2.92	10.28	3.43
		20	4.56	4.22	3.91	12.69	4.23
		23	2.47	4.02	4.64	11.13	3.71

Attachment 16.(Continued)

		26	2.15	4.02	3.11	9.28	3.09
		29	3.42	3.68	2.47	9.57	3.19
		32	3.91	3.27	2.15	9.34	3.11
		35	3.56	2.15	2.15	7.87	2.62
	Sub Total		31.50	32.75	28.94	93.19	
	Average		3.15	3.28	2.89		3.11
8	G8	8	2.15	2.15	2.15	6.46	2.15
		11	2.15	2.15	2.15	6.46	2.15
		14	3.56	3.11	3.80	10.47	3.49
		17	4.12	2.92	3.68	10.73	3.58
		20	3.91	4.31	3.42	11.64	3.88
		23	4.22	3.91	4.40	12.53	4.18
		26	4.02	3.80	3.68	11.51	3.84
		29	3.91	2.92	3.42	10.26	3.42
		32	3.91	2.71	3.42	10.05	3.35
		35	3.11	2.15	2.15	7.42	2.47
	Sub Total		35.08	30.16	32.29	97.53	
	Average		3.51	3.02	3.23		3.25
9	G9	8	2.15	2.15	2.15	6.46	2.15
		11	2.15	2.15	2.15	6.46	2.15
		14	2.15	2.92	2.15	7.23	2.41
		17	4.02	3.56	3.11	10.68	3.56
		20	4.12	3.68	3.91	11.72	3.91
		23	3.27	3.91	3.91	11.10	3.70
		26	3.80	4.40	4.12	12.32	4.11
		29	2.92	3.91	4.56	11.40	3.80
		32	3.27	2.15	2.92	8.35	2.78
		35	2.15	2.15	2.15	6.46	2.15
	Sub Total		30.03	31.01	31.16	92.20	
	Average		3.00	3.10	3.12		3.07
Total			278.20	279.51	269.11	826.82	
Average				30.91	31.06		91.87

G1 = FA 1–1–4–3–6–8–B ; G2 = FS 3–4–7–1–B ; G3 = FA 3–2–13–14–B ; G4 = FA 1–1–5–3–18–B ; G5 = FA 1–1–10–1–6 ; G6 = FS 3–4–10–3–B ; G7 = FS 3–4–8–2–B ; G8 = Fagiola IPB And G9 = Aura Green.

Attachment 16.(Continued)

Table Plot Main

Line	Group			Total	Average
	1	2	3		
FA 1–1–4–3–6–8–B	32.74	32.37	29.97	95.08	31.69
FS 3–4–7–1–B	27.39	29.33	29.32	86.04	28.68
FA 3–2–13–14–B	30.87	33.58	31.38	95.82	31.94
FA 1–1–5–3–18–B	31.85	30.07	26.89	88.82	29.61
FA 1–1–10–1–6	30.85	31.46	30.09	92.40	30.80
FS 3–4–10–3–B	27.90	28.78	29.05	85.74	28.58
FS 3–4–8–2–B	31.50	32.75	28.94	93.19	31.06
Fagiola IPB	35.08	30.16	32.29	97.53	32.51
Green Aura	30.03	31.01	31.16	92.20	30.73
Total	278.20	279.51	269.11	826.82	275.61
Average	30.91	31.06	29.90	91.87	30.62

Attachment 16. (Advanced)

Table Child Plot

Line	Age Harvest (HSA)										Total	Average
	8	11	14	17	20	23	26	29	32	35		
FA 1–1–4–3–6–8–B	6.46	6.46	9.59	11.89	13.08	12.71	12.00	9.40	7.02	6.46	95.08	9.51
FS 3–4–7–1–B	6.46	6.46	7.87	11.14	12.30	12.32	8.91	7.34	6.78	6.46	86.04	8.60
FA 3–2–13–14–B	6.46	6.46	10.06	10.40	12.46	12.05	11.85	11.88	7.73	6.46	95.82	9.58
FA 1–1–5–3–18–B	6.46	6.46	8.04	7.89	11.05	11.62	11.84	9.65	9.33	6.46	88.82	8.88
FA 1–1–10–1–6	6.46	6.46	8.31	10.85	12.53	11.05	8.18	11.02	10.51	7.02	92.40	9.24
FS 3–4–10–3–B	6.46	6.78	8.70	9.45	12.69	11.67	8.50	7.79	7.23	6.46	85.74	8.57
FS 3–4–8–2–B	6.46	6.46	10.10	10.28	12.69	11.13	9.28	9.57	9.34	7.87	93.19	9.32
Fagiola IPB	6.46	6.46	10.47	10.73	11.64	12.53	11.51	10.26	10.05	7.42	97.53	9.75
Aura Green	6.46	6.46	7.23	10.68	11.72	11.10	12.32	11.40	8.35	6.46	92.20	9.22
Total	58.17	58.48	80.37	93.32	110.18	106.16	94.39	88.32	76.34	61.08	826.82	
Average	6.46	6.50	8.93	10.37	12.24	11.80	10.49	9.81	8.48	6.79	91.87	

Attachment 16. (Advanced)

1. Table ANOVA

Source Diversity	Degrees Free	Amount Square	Square Middle	F Count	F Table
Plot Main					
Group (r)	2	0.72	0.36	1.48 ^{ns}	3.63
Line (g)	8	4.71	0.59	2.42 ^{ns}	2.59
Error $_{(g)}$	16	3.89	0.24		
Subplot					
Age Harvest (p)	9	122.19	13.58	72.15 *	1.94
GxP Interaction	72	24.57	0.34	1.81 *	1.38
Error $_{(p)}$	162	30.49	0.19		
Total	269	186.57			

Information: * = Significant (F Count > F Table); ns = No significant

2. Coefficient Diversity

$$KK_{(g)} = \frac{\sqrt{KTE(g)}}{\text{Average Total}} \times 100\% = \frac{\sqrt{0.24}}{91.87} \times 100\% = 16.12\%$$

$$KK_{(p)} = \frac{\sqrt{KTE(p)}}{\text{Average Total}} \times 100\% = \frac{\sqrt{0.19}}{91.87} \times 100\% = 14.18\%$$

3. Variety

Variety Genotype ($\sigma^2 g$) = (KTG –KTE)/r

= (0.59–0.24)/3

= 0.12

Variety Phenotype ($\sigma^2 f$) = $\sigma^2 g$ + KTE

= 0.12 + 0.24

= 0.36

Variety Error = KTE = 0.24

Attachment 16. (Advanced)

4. Heritability

Heritability ($h^2 bs$) $= (\sigma^2 g / \sigma^2 f) \times 100\%$

$= (0.12/0.36) \times 100\%$

$= 33.3\%$

5. Results Test Carry on Different Real Honest (BNJ) on level 0.05

Results Sd (Error Standard) Harvest Age (P) Plant Peanut Long

$Sd = \sqrt{\frac{KTE(p)}{rg}} = \sqrt{\frac{0.19}{27}} = 0.08$

Mark q–tukey q(α,p,db)

Level real (α) = 0.05

Amount Treatment (P) = 10

Degrees of Error Freedom $_p$ = 162

Tukey's q–value $q_{(0.05,10,162)}$ = 4.54

HSD value with real level α HSD

$= q_{(0.05,90,162)} \times Sd$

$= 4.54 \times 0.84$

$= 0.38$

Attachment 16. (Advanced)

Table Matrix Mark Middle Character Power Germination Treatment Age Harvest (P) Plant Long beans

Harvest Age	Middle Value	P5	P6	P7	P4	P8	P3	P9	P10	P2	P1	Notation
		59.81	53.33	37.22	34.44	28.89	18.52	17.04	2.41	0.19	0.00	
P5	4.08	0.00 ^{ns}										a
P6	3.93	0.15 ^{ns}	0.00 ^{ns}									a
P7	3.50	0.58*	0.44*	0.00 ^{ns}								b
P4	3.46	0.62*	0.48*	0.04 ^{ns}	0.00 ^{ns}							b
P8	3.27	0.81*	0.66*	0.23 ^{ns}	0.19 ^{ns}	0.00 ^{ns}						bc
P3	2.98	1.10*	0.96*	0.52*	0.48*	0.29 ^{ns}	0.00 ^{ns}					CD
P9	2.83	1.25*	1.10*	0.67*	0.63*	0.44*	0.15 ^{ns}	0.00 ^{ns}				d
P10	2.26	1.82*	1.67*	1.23*	1.19*	1.01*	0.71*	0.57*	0.00 ^{ns}			e
P2	2.17	1.91*	1.77*	1.33*	1.29*	1.11*	0.81*	0.66*	0.10 ^{ns}	0.00 ^{ns}		e
P1	2.15	1.93*	1.78*	1.34*	1.30*	1.12*	0.82*	0.67*	0.11 ^{ns}	0.01 ^{ns}	0.00 ^{ns}	e

P1 = 8 HSA ; P2 = 11 HSA ; P3 = 14 HSA ; P4 = 17 HSA ; P5 = 20 HSA ; P6 = 23 HSA ; P7 = 26 HSA ; P8 = 29 HSA ; P9 = 32 HSA and P10 = 35 HSA.

Attachment 16. (Advanced)

Results Sd (Error (Baku) Line (G) x Age Harvest (P) Plant Peanut Long

$Sd = \sqrt{\frac{KTE(p)}{r}} = \sqrt{\frac{0.19}{3}} = 0.25$

Mark q–tukey q(α,p,db)

Real level (α) = 0.05

Number of Treatments (G x P) = 90

Degrees of Error Freedom $_p$ = 162

Tukey's q–value $q_{(0.05,90,162)}$ = 4.54

HSD value with real level α HSD

$= q_{(0.05,90,162)}$ x Sd

= 4.54 x 0.25

= 1.14

Attachment 16 **.** (Advanced)

Table BNJ Test Line (G) x Age Harvest (P) on Character Power Germinating Long Bean Plants

Line -	Age Harvest (HSA)									
	8	11	14	17	20	23	26	29	32	35
FA 1–1–4–3–6–8–B	2.15c	2.15c	3.20bc	3.96ab	4.36a	4.24ab	4.00ab	3.13bc	2.34c	2.15c
FS 3–4–7–1–B	2.15d	2.15d	2.62 cd	3.71abc	4.10ab	4.11a	2.97bcd	2.45d	2.26d	2.15d
FA 3–2–13–14–B	2.15c	2.15c	3.35ab	3.47ab	4.15a	4.02a	3.95a	3.96a	2.58bc	2.15c
FA 1–1–5–3–18–B	2.15c	2.15c	2.68bc	2.63bc	3.68ab	3.87a	3.95a	3.22abc	3.11abc	2.15c
FA 1–1–10–1–6	2.15c	2.15c	2.77bc	3.62ab	4.18a	3.68ab	2.73bc	3.67ab	3.50ab	2.34c
FS 3–4–10–3–B	2.15c	2.26c	2.90bc	3.15abc	4.23a	3.89ab	2.83bc	2.60c	2.41c	2.15c
FS 3–4–8–2–B	2.15c	2.15c	3.37ab	3.43ab	4.23a	3.71ab	3.09bc	3.19abc	3.11abc	2.62bc
Fagiola IPB	2.15c	2.15c	3.49ab	3.58ab	3.88a	4.18a	3.84a	3.42ab	3.35ab	2.47bc
Aura Green	2.15c	2.15c	2.41c	3.56ab	3.91ab	3.70ab	4.11a	3.80ab	2.78bc	2.15c

Attachment 16. (Advanced)

Analysis of variance on quantitative characters was also carried out using STAR (*Statistical Tool for Agricultural Research*) software. Input And output from STAR in complete can seen on *barcode* beside.

(STAR *Barcode*)

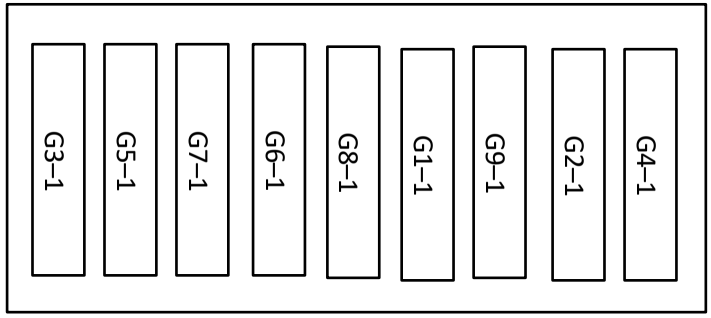
Attachment 17. Results Calculation Coefficient Correlation And Track.

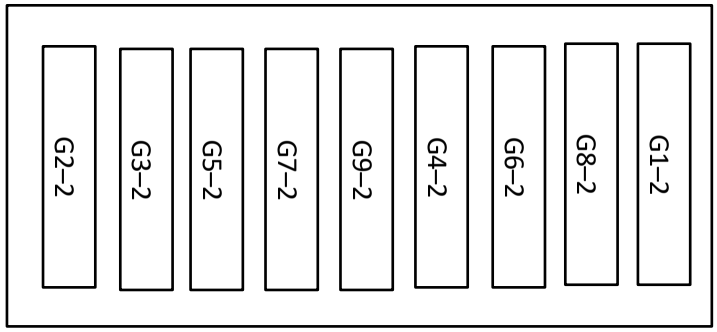
Analysis correlation And analysis path using *software* R Studio. Input and output from R Studio in a way Complete details for this analysis can be seen on *the barcode* on the side.

(*Barcode* R Studio)

Lampiran 18. Layout Percobaan

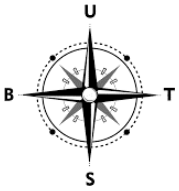
Kel. 1 (Teras 1)



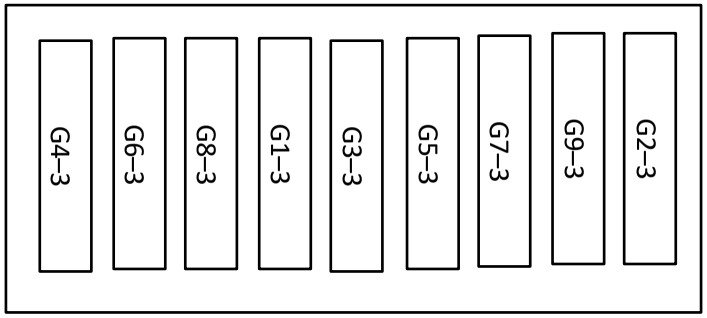


Kel. 2 (Teras 2)

Keterangan :
G1 : FA 1-1-4-3-6-8-B
G2 : FS 3-4-7-1-B
G3 : FA 3-2-13-14-B
G4 : FA 1-1-5-3-18-B
G5 : FA 1-1-10-1-6
G6 : FS 3-4-10-3-B
G7 : FS 3-4-8-2-B
G8 : Fagiola IPB
G9 : Aura Putih



Kel. 3 (Teras 3)

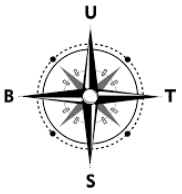


Attachment 18. (Advanced)

❖ Child Plot (Age Harvest)

Kelompok 1

G3-1	G5-1	G7-1	G6-1	G8-1	G1-1	G9-1	G2-1	G4-1
G3P6-1	G5P3-1	G7P6-1	G6P8-1	G8P9-1	G1P10-1	G9P2-1	G2P5-1	G4P10-1
G3P9-1	G5P5-1	G7P7-1	G6P2-1	G8P4-1	G1P7-1	G9P6-1	G2P1-1	G4P2-1
G3P2-1	G5P7-1	G7P9-1	G6P1-1	G8P6-1	G1P3-1	G9P10-1	G2P4-1	G4P6-1
G3P5-1	G5P4-1	G7P3-1	G6P9-1	G8P3-1	G1P4-1	G9P1-1	G2P7-1	G4P4-1
G3P3-1	G5P9-1	G7P10-1	G6P4-1	G8P8-1	G1P1-1	G9P9-1	G2P9-1	G4P3-1
G3P4-1	G5P1-1	G7P5-1	G6P6-1	G8P7-1	G1P8-1	G9P4-1	G2P10-1	G4P7-1
G3P1-1	G5P10-1	G7P8-1	G6P5-1	G8P10-1	G1P6-1	G9P3-1	G2P3-1	G4P8-1
G3P7-1	G5P6-1	G7P1-1	G6P10-1	G8P2-1	G1P2-1	G9P7-1	G2P6-1	G4P9-1
G3P8-1	G5P2-1	G7P4-1	G6P3-1	G8P1-1	G1P5-1	G9P5-1	G2P2-1	G4P5-1
G3P10-1	G5P8-1	G7P2-1	G6P7-1	G8P5-1	G1P9-1	G9P8-1	G2P8-1	G4P1-1



Kelompok 2

G2-2	G3-2	G5-2	G7-2	G9-2	G4-2	G6-2	G8-2	G1-2
G2P2-2	G3P6-2	G5P3-2	G7P6-2	G9P5-2	G4P1-2	G6P9-2	G8P1-2	G1P3-2
G2P6-2	G3P4-2	G5P8-2	G7P10-2	G9P4-2	G4P6-2	G6P4-2	G8P10-2	G1P1-2
G2P10-2	G3P10-2	G5P6-2	G7P5-2	G9P6-2	G4P9-2	G6P10-2	G8P3-2	G1P9-2
G2P1-2	G3P9-2	G5P10-2	G7P8-2	G9P1-2	G4P10-2	G6P7-2	G8P9-2	G1P2-2
G2P7-2	G3P7-2	G5P2-2	G7P4-2	G9P9-2	G4P3-2	G6P6-2	G8P5-2	G1P7-2
G2P3-2	G3P8-2	G5P1-2	G7P7-2	G9P3-2	G4P8-2	G6P3-2	G8P2-2	G1P5-2
G2P4-2	G3P1-2	G5P9-2	G7P2-2	G9P8-2	G4P2-2	G6P1-2	G8P8-2	G1P4-2
G2P9-2	G3P3-2	G5P5-2	G7P3-2	G9P2-2	G4P7-2	G6P8-2	G8P7-2	G1P6-2
G2P5-2	G3P2-2	G5P4-2	G7P9-2	G9P10-2	G4P5-2	G6P2-2	G8P6-2	G1P10-2
G2P8-2	G3P5-2	G5P7-2	G7P1-2	G9P7-2	G4P4-2	G6P5-2	G8P4-2	G1P8-2

Information:

P1 = 8 HSA

P2 = 11 HSA

P3 = 14 HSA

P4 = 17 HSA

P5 = 20 HSA

P6 = 23 HSA

P7 = 26 HSA

P8 = 29 HSA

P9 = 32 HSA

P10 = 35 HSA

Kelompok 3

G4-3	G6-3	G8-3	G1-3	G3-3	G5-3	G7-3	G9-3	G2-3
G4P1-3	G6P10-3	G8P6-3	G1P6-3	G3P8-3	G5P3-3	G7P6-3	G9P2-3	G2P1-3
G4P8-3	G6P2-3	G8P2-3	G1P9-3	G3P7-3	G5P7-3	G7P5-3	G9P6-3	G2P7-3
G4P3-3	G6P5-3	G8P7-3	G1P7-3	G3P2-3	G5P10-3	G7P7-3	G9P1-3	G2P5-3
G4P9-3	G6P1-3	G8P1-3	G1P2-3	G3P3-3	G5P1-3	G7P10-3	G9P4-3	G2P8-3
G4P2-3	G6P7-3	G8P4-3	G1P10-3	G3P10-3	G5P2-3	G7P9-3	G9P7-3	G2P9-3
G4P10-3	G6P3-3	G8P5-3	G1P1-3	G3P9-3	G5P8-3	G7P2-3	G9P10-3	G2P6-3
G4P4-3	G6P9-3	G8P10-3	G1P5-3	G3P4-3	G5P5-3	G7P8-3	G9P3-3	G2P2-3
G4P5-3	G6P4-3	G8P9-3	G1P4-3	G3P5-3	G5P6-3	G7P4-3	G9P9-3	G2P3-3
G4P6-3	G6P8-3	G8P3-3	G1P8-3	G3P1-3	G5P9-3	G7P1-3	G9P8-3	G2P10-3
G4P7-3	G6P6-3	G8P8-3	G1P3-3	G3P6-3	G5P4-3	G7P3-3	G9P5-3	G2P4-3

HISTORY LIFE

Writer named complete Nadiroh, born in Pati, April 10, 2003, the third of three children. The author was born from partner husband and wife Mr. Suyoto and Mrs. Muinah. The author completed his elementary education at SDN 01 Sumbersoko, Sukolilo, Pati in 2009–2015, and SMPN 1 Sukolilo, Pati year 2015–2018, SMAN 1 Kayen, Pati year 2018–2021 on major Mathematics and Natural Sciences. Year 2021 the author continues his studies in Universitas Diponegoro, on program studies Bachelor of Agroecotechnology, Department of Agriculture, Faculty of Animal and Agricultural Sciences. During his studies, the author participated in the Minerva *Research Club organization* in 2022–2023. become member division education And research, as well as become member PSDM field of Pati Student Community (KOMPI) in 2022–2023. The author was also active as a practical assistant for the Plant Ecology course in 2022–2023, as well as an assistant for Seed Production and Storage in 2024. The author has carried out PKL with the title "Rice Cultivation Techniques (*Oryza sativa* L.) Upland Cultivating System at the Agricultural Environmental Instrument Standards Testing Center, Regency Starch, Province Java Middle". During studying writer Also active take part in the competition, between other become Champion 2 LKTIN Student FPP UNDIP year 2023, recipient of funding for 2 PKM-PM titles in 2023, and participant of the Student Scientific Week National (PIMNAS) 36th in University Padjadjaran year 2023. Currently, the author is actively studying in the Agroecotechnology undergraduate program.