## BIBLIOGRAPHY

SUGOT, ALEPHA MARIE G. APRIL 2010. Agromorphological Diversity and Cluster Analysis of Selected Eleven Accessions of Garden Pea. Benguet State University, La Trinidad, Benguet.

Adviser: Leoncia L. Tandang, PhD.

## ABSTRACT

The eleven accessions of garden pea were characterized to estimate variation through diversity and cluster analysis. They differed in the agromorphological characters observed in this study.

Diversity analysis revealed low variation among the eleven garden pea accessions evaluated. The computed diversity indices for the quantitative characters ranged from 0.13 to 0.58 with a mean value of 0.41. The diversity indices for qualitative characters ranged from 0.72 to 0.98 with a mean diversity of 0.89. Pooling diversity values for the quantitative and qualitative characters gave an overall diversity index of 0.65 in the collection.

Cluster analysis among the eleven accessions of garden pea based on their 32 qualitative characters formed four clusters. There was one single cluster with one single accession, two clusters with three accessions each and one cluster with four accessions.

The existence of clusters with three or more accessions indicated the high variation among the clusters studied and high similarities within a cluster.

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## INTRODUCTION

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Garden pea (*Pisum sativum),* an edible legume or pulse crop is one of the first plant domesticated in the Middle East, from where it spread to the temperate old world. Garden pea is produced in significant quantities in over 90 countries and is now the fourth legume in terms of world production (IPGRI, 2009).

Fundamental changes in ecology, economics and agricultural production have caused a decrease in global production and genetic erosion of plant gene pools in both cultivated and natural wild ecosystems. A large number of old local cultivars and landraces have been replaced by modern cultivars and hybrids that is more suitable for new production technologies. Nevertheless, these old genotypes may possess valuable irreplaceable characters. Having such genotypes ensures the sustainability of agriculture and indeed life. The need for the protection of the genetic resources is one of the priorities of a human society (Stickland, 1998).

Diversity collection is very important to buffer farmers against changing circumstances. Diverse farming systems adapt and help poor farmers to survive change.

Since garden pea is one of the most important food legumes in terms of world production, it needs to be characterized and evaluated in order to know the best varieties that are suited in an area. Most of the accepted characteristics of garden pea are high yield and resistance to pest and diseases. Consumer's preferences must also be considered because even if a variety is high yielding if the consumers or the farmer-growers do not like its pod and other traits, it would affect its demand or marketability.

Crop improvement depends on the germplasm diversity existing in the crop of interest. Pea and other cool season food legume crops are produced under the vagaries of

stresses, both biotic and abiotic. Evaluation of these crops would help on the improvement of its performance. Evaluation refers to the periodic process of gathering data and then analyzing or ordering it in such a way that the resulting information can be used to determine whether these plants are effectively performing to the extent to which it is achieving its stated objectives and anticipated results.

Characterization, on the other hand, involves a careful description of the special characteristics that are inherited, easy to score and expressed consistently in all environments. Characterization is a description of character or traits or essential features of a variety. During the process of characterizing accessions, the expression of highly heritable characters, varying from the morphological features and seed proteins to the latest molecular markers, will be determined to check the true-to-type of homogeneous samples. Such characters also enable an easy, guide discrimination between phenotypes, and allow a simple grouping of the accession. Scoring this also allows the establishment of systematic relationships between the accessions and even crops, including their evolutionary relationships.

Cluster analysis is a collective term covering a wide variety of techniques for delineating natural groups or clusters in data sets. The results of cluster analysis may contribute to the definition of a formal classification scheme, such as taxonomy for related insects or plants. It also suggests statistical models with which to describe populations of it indicates rules for assigning new cases to classes for identification and diagnostic purposes. By doing cluster analysis, a researcher will know if the selected lines are closely related among them based on the similarities and differences in terms of agro-morphological characters (IPGRI, 2009).

As climate change continues to change the geography of agriculture, we have to mimic natural systems ourselves and use a diversity of approaches to ensure that farmers and breeders have the ability to get hold of and make use of as much diversity as possible. Diversity resides within the varieties grown by the poor rural farmers so farmers who choose to grow traditional varieties are generally more than one variety, which is the deliberate choice in favor of diversity (IPGRI, 2009). This study will characterize the existing diversity present among the selected accessions of garden pea.

The objectives of the study were to:

1. morphologically characterize the eleven accessions of garden pea;
2. evaluate the agronomic characters of the garden pea accessions;
3. determine level of diversity of quantitative and qualitative characters; and
4. to determine their relationship through cluster analysis.

The study was conducted at Benguet State University-Institute of Plant Breeding-Highland Crops Research Station (BSU-IPB-HCRS) from November 2009 to March 2010.

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## REVIEW OF LITERATURE

### Cultivation

Garden peas grow best on a well-drained, rich fertile soil with a pH of 6.0-7.0. Seeds germinate in a wide range of soil temperature of 4˚-14˚C. Sow seeds at a minimum depth of .75-1 cm apart in double rows spaced .75-3 cm apart, 12 cm between the next double rows. Garden pea should not become too dry when they are in full bloom or when the pods are swelling. Too much water before flowering reduces yield (Parker, 2000). According to Poincelot in 2004, picking of garden pea should begin after four weeks after full flowering. They are ready to be picked when their pods are well developed and fully green but before the peas harden or lose their sugar content to starch.

### Varietal Evaluation

Annogue (1997) evaluated eleven promising lines of garden pea lines under La Trinidad Benguet condition. He reported that CGP 158 produced the highest yield per plot per hectare. It was also earliest to mature and it produced the most number of pods per hectare. CGP 158 was also resistant to leaf miner (*Phytomasa articoonis*) and produced the good quality pods and seeds.

Bay-an (2000) evaluated the performance and acceptability of six promising garden pea variety produced by the BSU-IPB-HRCS in Atok, Benguet. Results show that all the six varieties were suited to the locality because of their good yield performance ranging from 2.82-4.61 tons per hectare. They were also vigorous and mildly resistant to leaf miner. Trinidad was the highest yielder but it was moderately liked because of its

bigger pods. Taichung, 89-001, and the Chinese garden peas were most preferred due to their small pods.

Paganas (2005) characterized and evaluated five commercial grown garden pea varieties in Benguet. Kalantao, Chinese white, CGP 39 and 89-001 were identified as high yielding varieties. Kalantao, CGP 39 and 89-001 significantly produces the highest number and weight of marketable pods per plot and thus recommended garden pea growers in La Trinidad.

In 2006, Gawidan evaluated ten garden pea entries for fresh pod and seed yield under La Trinidad condition. Significant differences were observed among the ten entries of garden pea evaluated in terms of number of days t o first and last flowering, number of nodes to first flower, number of pods per plant, pod width and fresh pod yield per plot. N2634, 89-001 and CLG produced the highest fresh pod yield per plot per hectare. CGP 59 was observed to have moderate resistance to leaf miner and Ascochyta leaf spot.

Subelan (2006) also characterized the diversity and cluster analysis of different accessions of garden pea under La Trinidad,Benguet. The 154 accessions differ in the characters observed. Out of the 154 accessions observed, twenty were selected and identified as promising materials for commercialization because of their prolificacy and their pod quality. The computed diversity indexes for the quantitative characters ranged from 0.63 (number of days from flowering to pod setting) to 0.99 (number of flower per cluster) with a mean diversity index of 0.87. The diversity indexes for quantitative characters ranged from 0.34-0.99 with a mean diversity index of 0.73. Pooling of diversity indexes for all the characters observed gave an over all mean diversity index of 0.80, an indication of high variation with in the collection.

Cluster analysis for the twenty-eight characters formed a distinct cluster at the dissimilarity coefficient of 14.73. There were eight single character clusters and six two to six character clusters. This indicated that the clusters with single character were distinct from each other and form clusters with two or more characters. Cluster analysis for accessions resulted in the formation of a 3 tree with 41 clusters at a dissimilarity coefficient of 0.50. There were 14 single accessions cluster, 10 2 cluster and 17 3 to 15 accession clusters. The existence of cluster with three or more accession indicated the presence of high variation among the clusters of the accessions studied and high similarities with in the cluster.

Recently, Del-amen (2009) evaluated the performance and farmer's acceptability of six promising lines of garden pea. Results showed that all the six promising lines were suitable in Madaymen because of their good growth and fresh pod yield ranging from 8.65-11.43 kg/10m2. They were all vigorous and highly resistant to leaf miners and powdery mildew. CGP 34 and CGP 18A were the earliest to emerge and produce flowers together with CGP 13. CGP 110 was the tallest while Kalantao was the shortest at 35 days after planting. All six lines showed high resistant to leaf miner and powdery mildew except for the CGP 18A which had mild resistance to powdery mildew. CGP 110 and Kalantao produced the highest marketable and total fresh pod yield per plot but Kalantao was disliked by the farmers because of its big and curve pods.

Varietal Evaluation on other crops

Rebujio (2003) morphologically characterized through diversity analysis and evaluated sweet potato genotypes at La Trinidad, Benguet. Results showed that the sweet potato genotypes show significant differences for leaf area, canopy cover, number of

leaves, number of nodes, vine length, vine diameter, number and weight of marketable and non-marketable storage root yield and storage root yield. Genotypes Tagalog, PSB Sp 17 and Kawitan significantly produced the highest marketable yield. They were also moderately resistant to leaf folder. High diversity indexes were noted for quantitative characters. How ever, low diversity indexes were observed for qualitative characters. The result indicates high variation among the sweet potato genotypes for quantitative characters and low variation for qualitative characters. This indicates that selection should be for quantitative characters of sweet potato.

Remoquillo (2003) evaluated the morphological diversity and yield performance of different corn accessions collected from different sources. Seventeen corn accessions significantly differ in the number of days from planting to emergence, number of days from sowing to tasselling or silking, total number of leaves, length of leaves, plant height, number of internodes, basal stem diameter, tassel peduncle length, tassel peduncle diameter, ear diameter, length of the ear, ear height, number of kernel rows, number of kernel in a row, 1000 kernel weight, weight of marketable ear, weight of non-marketable ear per plot and the total yield. Tassel length and number of marketable and non-marketable ears per plot were not significantly different among the accessions evaluated.

IP 13 hybrid all produced the highest marketable yield but it is comparable with BS 9890 and GSI 40. The good performance maybe attributed to their resistance to corn earworm, leaf blight and downy mildew hence, can be considered adapted to the locality. Results of diversity analysis showed low variation with in the collection for the qualitative characters. Medium variation was noted for the quantitative characters.

Pooling of diversity indexes gave an over all diversity index of 0.49, an indication of low variability among the collections.

Among the seventeen corn accessions, IES glutinous number 2 and Los Banos Lagkitan were the moderately liked, thus, recommended for green corn.

Ignacio (2005) morphologically characterize and evaluated through diversity analysis of indigenous rice bean accessions from Benguet. Nine indigenous rice bean accessions were from Benguet Province. Results shows for variability were observed for number of days from emergence to flowering, seed filling, stem length, number of flower per cluster, leaf area, pod length, plant height, leaf length and weight of 100 seeds. The diameter of the stem, number of nodes to flowering, inflorescence length, number of seeds per pod and pod width did not differ significantly. The accessions of Ambongdolan, Tublay produced the widest, longest and heaviest seeds. It also showed good growth performance such as initial and final plant height, leaf length and pod width and length. Diversity analysis of qualitative characters show high variation for leaf shape, pod curvature and seed color. High variation indicates selection for these characters. Cluster analysis show grouping of the accessions into two major clusters and three sub-clusters.

Tandang and Alfonso (2007) studied sweet potato varieties through morphological diversity and cluster analysis in the Northern Philippine highland. They morphologically characterize sixteen commercial varieties of sweet potato to access genetic diversity. Estimation of variability for each character was done using Standardized Shannon-Weaver Diversity Index. Qualitative and quantitative data were also subjected to cluster analysis.

The qualitative characters observed in this study varied among the sixteen sweet potato varieties characterized. They showed highly significant differences for all the quantitative characters measured except for the number of non-marketable storage root yield.

PSB Sp 22, NSIC Sp 31, UPL Sp 2, UPL Sp 1 and PSB Sp 14 were the varieties that gave the significantly highest marketable storage root yield. UPL Sp 28, PSB Sp 18, PSB Sp 23, NSIC Sp 29, PSB Sp 21 and NSIC Sp 30 were the varieties that gave the significantly highest percentage dry matter content.

Databases of the fourteen qualitative and fifteen quantitative characters of the sixteen sweetpotato varieties were established using Microsoft Excel Program.

High diversity indexes for the qualitative (0.70-0.99) and quantitative (.84-0.97) were obtained with a mean diversity index of H' = 0.88 indicating the existence of high diversity in the collection of sixteen sweetpotato varieties at Benguet State University.

Cluster analysis located seven distinct clusters formed among the sixteen varieties of sweetpotato at 0.68 coefficient of dissimilarity for single variety clusters, one-two variety cluster, and two-five variety clusters.

## MATERIALS AND METHODS

An area of 165 $m^2$ was thoroughly cleaned and prepared. The area was divided into three blocks, consisting of eleven plots each with a dimension of 1m x 5m. The experimental treatments were laid out using Randomized Complete Block Design (RCBD) with three replications. Two seeds per hill were sown at a depth of 2-3 cm with a distance of 20 cm between hills and between rows. There were two rows per plot. Basal application of chicken manure with a rate of 0.75 kg and 0.25 kg per plot and complete fertilizer were properly mixed with the soil.

All the necessary cultural and management practices of farmers growing garden pea was employed uniformly such as weeding, irrigation and putting of plastic twine for the plants to cling.

The accessions obtained from BSU-IPB-HRCS served as treatments.

| CODE | ACCESSIONS |
|---|---|
| ACC 1 | CGP 154 |
| ACC 2 | CGP 11 |
| ACC 3 | CGP 59 |
| ACC 4 | CGP 116 |
| ACC 5 | CGP110 |
| ACC 6 | CGP 13 |
| ACC 7 | CHINESE PEA |
| ACC 8 | CGP 34 |
| ACC 9 | BETAG |

| | |
|---|---|
| ACC 10 | CLG |
| ACC 11 | TAICHUNG |

Data Gathered

A. Quantitative Characters

1. Maturity

a. Number of days from sowing to emergence. This was obtained by counting the number of days from sowing to emergence.

b. Number of days from emergence to flowering. This was recorded by counting the number of days from emergence to the time when at least 50% of the plants per plot had at least two fully opened flowers.

c. Number of days from emergence to last flowering. This was recorded by counting the number of days from emergence to the last flowering when 50% of the plant per plot had stopped flowering.

d. Number of days from emergence to pod setting. This was obtained by counting the number of days from emergence until the plants produced pods.

e. Number of days from emergence to first and last harvesting. This was recorded by counting the number of days from emergence to first and last harvesting.

f. Number of days from flowering to pod setting. This was obtained by counting the number of days from flowering until the pods began to develop.

g. Number of days from pod setting to pod maturity. This was recorded by counting the number of days from pod setting to pod maturity

2. Leaf Characteristics

a. Leaflet length (cm). This was measured using a foot ruler from the base of the petiole to the leaf tip of the ten sample leaves per treatment at 35 days after planting.

b. Leaflet width (cm). Leaf width of the ten samples used in gathering leaf length was gathered by measuring the broadest part of the leaf using a foot ruler at 35 days after planting.

c. Number of leaves per plant. This was recorded by counting the number of leaves of ten sample plants per replication during harvesting.

d. Tendril length (cm). This was measured from the base to the tip of the tendril using a ruler when the pods were fully matured.

3. Stem Characteristics

a. Plant height at 35 days after planting. This was measured from the base of the plant at ground level to the tip of the youngest shoot using a meter stick from the ten sample plants per replication at 35 days after planting.

b. Number of nodes per plant. This was counted from the base of the plant to the tip of the main stem of the ten sample plants per treatment during the last harvest.

c. Node number bearing first flower cluster. This was recorded by counting the node from the base of the plant to the node bearing the first flower cluster in five sample plants per treatment.

d. Node number bearing first pod. This was recorded by counting the nodes from the base of the plants to the node bearing first pod cluster in five sample plants per treatment.

e. Node number bearing last pod. This was recorded by counting the node from the base of the plants to the node bearing last pod cluster in five sample plants per treatment.

f. Internode length (cm). This was measured by getting the mean length of three internodes at the midpoint of the plant.

g. Number of branches. This was obtained by counting the number of branches of the plants one week before harvesting.

h. Final plant height at maturity (cm). This was measured from the base of the plant to the tip of the plant using a meter stick at maturity.

4. Flower Characteristics

a. Number of flowers per plant. This was recorded by counting the flowers per plant in ten sample plants per treatment per replication at the peak of the flowering.

b. Number of flowers per cluster. This was recorded by counting the flowers per cluster per replication at the peak of flowering.

c. Number of flower cluster per plant. This was recorded by counting the flower cluster per plant per treatment per replication around 50 days after planting.

d. Plant height at flowering (cm). This was recorded by measuring the height of the plant from the base to the tip of the plant.

5. Pod Characteristics

a. Pod length (cm). This was obtained by measuring the length of ten pods per treatment from the base to the tip of pod.

b. Pod width (cm). This was obtained by measuring the broadest part of sample pods used in gathering pod length using foot rule.

c. Number of pods per cluster. This was obtained by getting the number of pods per cluster from the ten sample plant per plot.

d. Number of pods per plant. This was obtained by counting the number of pods per cluster per plant.

e. Percent pod set per plant. This was computed using the formula:

$$\% \text{ pod set} = \frac{\text{total number of pods per plant}}{\text{total number of flower per plant}} \text{ X } 100$$

f. Pod straightness. This was recorded as irregular, curved or straight.

6. Seed Characteristics

a. Number of seeds per pod. This was obtained by counting the number of seeds per pod from ten sample pods per treatment per replication.

7. Yield Characteristics

a. Weight of marketable fresh pods per plot (kg/5m$^2$). This was recorded by weighing the marketable pods per plot from first to last harvest. Marketable pods were smooth, well-formed pods and free from damages.

b. Weight of non-marketable pods per plot (kg/5m$^2$). This was obtained by weighing non-marketable pods per plot per treatment. These are the pods that were over-matured, malformed and damaged by insects and pest and diseases.

c. Total yield per plot (kg/5m$^2$). This was recorded by getting the total weight of marketable and non-marketable pods per plot per treatment throughout the harvest period.

B. Qualitative Characters

1. Leaf color. This was recorded as green, light green, dark green.

2. Flower color. This was recorded when 50% of the plants per plot have fully opened flowers using color chart

3. Pod color. This was recorded as green, light green, yellow, dark green.

4. Pod shape. This was recorded as flat, round, curve or straight.

5. Stringiness. This was recorded during the harvest and recorded whether green pod was stringy or stringless, stringy when the pods had suture or string when snapped and stringless when there is no pod suture.

6. Waxiness of pod. This was recorded by observing the presence or absence of wax in the pods.

7. Shininess of pod. This was recorded as shiny or dull.

8. Reaction to leaf miner infestation. This was gathered using the following scale used by Tandang *et.al*, in 2008:

| SCALE | DESCRIPTION | REMARKS |
|---|---|---|
| 1 | No damage | highly resistant |
| 2 | 1-25% infestations | moderately resistant |
| 3 | 26-50% infestations | resistant |
| 4 | 52-75% infestations | moderately susceptible |
| 5 | 76-100% infestations | very susceptible |

9. Reaction to powdery mildew. This was observed following the scale used by Tandang *et.al*, in 2008:

| SCALE | DESCRIPTION | REMARKS |
|---|---|---|
| 1 | No damage | highly resistant |
| 2 | 1-25% of the total leaves per plant per plot are infected | moderately resistant |
| 3 | 26-50% of the total leaves per plant per plot are infected | resistant |
| 4 | 51-75% of the total leaves per plant per plot are infected | moderately susceptible |
| 5 | 76-100% of the total leaves per plant per plot are infected | very susceptible |

Data Analysis

All quantitative data were analyzed using the analysis of variance (ANOVA) for the Randomized Complete Block Design (RCBD) with three replications. The significance of differences among treatment means was tested using the Duncan's Multiple Range Test at 5% level of significance.

Quantification of Variation Using the Shannon- Weaver Diversity Index

Estimate of variability for each quantitative and qualitative character was computed using the standardized Shannon- Weaver Design Index designated as H' for qualitative the following formula was used:

$$H' = \sum pi^* \log_2/\log_2 K$$

Where pi = relative frequency

K = number of descriptor states

The same formula was applied for the quantitative character following the construction of the frequency classes, with the class boundaries equal to some function of mean and standard deviation as used by Subelan in 2006. For each character the over all entry mean (X) and standard deviation (σ) was used to subdivide the accession values (X1) into frequency classes. The lowest and highest values were considered to determine the classes to construct. Thus the following formula was used to estimate variability in quantitative characters.

$$H' = \sum pi^* \log_2 Pi/\log_2 N$$

Where pi = relative frequency

N = number of classes

The Shannon - Weaver Diversity Index has a value ranging from 0 to 1, where 0 indicates absence of diversity and 1 indicates the maximum diversity.

Cluster Analysis

Using standardized data, numerical values of likeness or similarity was computed and distance matrix was constructed using the WARD'S method.

WARD'S method is an alternative approach for performing cluster analysis. Basically, it looks at cluster analysis as an analysis of variance problem, instead of using distance metrics or measures of association. This method involves an agglomerative clustering algorithm. It is most appropriate variables. Ward's method joins clusters to maximize the likelihood at each level of the hierarchy under these assumptions: multivariate normal mixtures, equal spherical covariance matrices and equal sampling probabilities.

## RESULTS AND DISCUSSION

Number of days from emergence to first and last harvesting, and pod setting

The eleven accessions of garden pea studied emerged within seven days after sowing except for Taichung which emerged one day later. CGP 13 was the earliest accession to produce flowers within 43 days after sowing (DAS) and Taichung was the

Table 1. Number of days from emergence to first and last harvesting, and pod setting of the eleven accessions of garden pea

| ACCESSION | NUMBER OF DAYS FROM EMERGENCE TO | | |
|---|---|---|---|
| | FIRST FLOWERING | LAST FLOWERING | POD SETTING |
| CGP 116 | 45[b] | 92[a] | 48[b] |
| CLG | 46[b] | 94[b] | 47[b] |
| CGP 13 | 43[a] | 94[b] | 49[b] |
| CGP 59 | 45[b] | 96[c] | 46[a] |
| CGP 154 | 48[c] | 94[b] | 50[b] |
| CGP 34 | 49[c] | 96[b] | 53[bc] |
| CGP 110 | 46[b] | 94[b] | 49[b] |
| Chinese pea | 49[c] | 97[b] | 46[a] |
| CGP 11 | 47[c] | 94[b] | 54[c] |
| Betag | 45[b] | 96[b] | 49[b] |
| Taichung | 54[d] | 98[d] | 58[d] |
| CV (%) | 7.11 | 1.12 | 17.49 |

Means with common letters are not significantly different at 5% level of significance using DMRT.

latest to flower at 45 days after emergence (DAE) (Table 1). The number of days from emergence to last flowering of the eleven accessions of garden pea evaluated differed significantly (Table 1). CGP 116 was the accession with the longest flowering period at 90 DAE, although Taichung flowered at 98 DAE. CGP 59 and Chinese pea accessions produced pods at 46 DAE while Taichung produced pods at 58 DAE.

Number of days from flowering to pod setting to pod maturity, from emergence to first flowering

CGP 13 was the earliest to set pod from six days after flowering together with CGP 116 and Betag. Other accessions set pods two to six days later (Table 2). This result corraborated with the findings of Gawidan (2006) that the garden pea varieties fully develop its pods in six to seven days after flowering. Table 2 also shows the number of days from emergence to first flowering of garden pea. CGP 13, CLG, CGP 110, Chinese pea were the earliest accessions harvested at 60 DAE and Taichung was the latest that was harvested at 66 DAE. There were no significant differences among all the eleven accessions of garden pea on the number of days from emergence to last harvesting. CGP 59 and CGP 34 were the last harvested at 90 DAE while the other accessions were last harvested three days later. Chinese pea matured within three days from pod setting, which was one to four days earlier than the other accessions.

Table 2. Number of days from flowering to pod setting, from pod setting to pod maturity, from emergence to first harvesting of eleven accessions of garden pea

| ACCESSION | NUMBER OF DAYS FROM | | |
|---|---|---|---|
| | FLOWERING TO POD SETTING | POD SETTING TO POD MATURITY | EMERGENCE TO FIRST HARVESTING |
| CGP 116 | 7[a] | 4[b] | 64[c] |
| CLG | 8[b] | 6[bc] | 60[a] |
| CGP 13 | 6[a] | 7[c] | 60[a] |
| CGP 59 | 8[b] | 7[c] | 62[b] |
| CGP 154 | 8[b] | 7[c] | 61[b] |
| CGP 34 | 13[c] | 6[bc] | 64[c] |
| CGP 110 | 8[b] | 7[c] | 60[a] |
| Chinese Pea | 10[b] | 3[a] | 60[a] |
| CGP 11 | 12[c] | 6[bc] | 64[c] |
| Betag | 7[a] | 6[bc] | 60[a] |
| Taichung | 13[c] | 7[c] | 66[d] |
| CV (%) | 17.49 | 24.08 | 2.14 |

Means of the letters are not significantly different at 5% level of Significance using DMRT

Node number bearing first flower,
first and last pod

Table 3 shows the node number bearing first flower cluster, first pod and last pod. Results showed that the eleven accessions of garden pea produced their first flower cluster and first pod on their 9th to 13th node. The last pod developed on the 19th to 23rd node.

Table 3. Node number bearing first flower cluster, first and last pod of the eleven accessions of garden pea

| ACCESSION | NODE NUMBER BEARING | | |
|---|---|---|---|
| | FIRST FLOWER CLUSTER | FIRST POD | LAST POD |
| CGP 116 | 12 | 12 | 21 |
| CLG | 12 | 12 | 22 |
| CGP 13 | 10 | 10 | 21 |
| CGP 59 | 13 | 13 | 20 |
| CGP 154 | 12 | 12 | 21 |
| CGP 34 | 12 | 12 | 23 |
| CGP 110 | 12 | 12 | 19 |
| Chinese Pea | 9 | 9 | 23 |
| CGP 11 | 11 | 11 | 23 |
| Betag | 10 | 10 | 20 |
| Taichung | 10 | 10 | 23 |
| CV (%) | 24.15 | 24.15 | 12.18 |

Number of flower cluster per plant, flowers per cluster, flower per plant

Among the eleven accessions of garden pea evaluated, CLG, CGP 13, CGP 34 and Chinese pea were observed to have two flowers per cluster while the other accessions had one flower per cluster (Table 4).

Table 4. Number of flower cluster per plant, flowers per cluster and flowers per plant

| | NUMBER OF FLOWERS | | |
|---|---|---|---|
| ACCESSION | CLUSTER PER PLANT | PER CLUSTER | PER PLANT |
| CGP 116 | 3[b] | 1[a] | 3[a] |
| CLG | 3[b] | 2[b] | 6[c] |
| CGP 13 | 2[c] | 2[b] | 4[b] |
| CGP 59 | 3[c] | 1[a] | 3[a] |
| CGP 154 | 2[c] | 1[a] | 2[a] |
| CGP 34 | 4[a] | 2[b] | 8[d] |
| CGP 110 | 2[c] | 1[a] | 2[a] |
| Chinese Pea | 4[a] | 2[a] | 8[d] |
| CGP 11 | 2[c] | 1[a] | 2[a] |
| Betag | 3[b] | 1[a] | 3[a] |
| Taichung | 2[c] | 1[a] | 2[a] |
| CV (%) | 12.20 | 17.75 | 12.20 |

Means the same letter are not significantly different at 5% level of significance using DMRT.

This result corroborated with the study of Gawidan (2006) that CGP 34, CGP 13 and CGP 18A had two flowers per cluster. But contradicted with the findings of Del-amen (2009) stating that CGP 18A had only one flower per cluster.

Highly significant differences were noted on the number of flowers per cluster per plant which ranged from two to four (Table 4). CGP 34 and Chinese pea had four flower clusters per plant while the other accessions had two to three flower clusters per plant. Chinese pea and CLG produced white flowers while the other accessions produced violet flowers.

Number of branches, nodes and leaves per plant

Table 5 shows the number of branches of the accessions that ranged from three to six. Chinese pea had six branches per plant while Taichung, Betag, CGP 34 produced three branches. The number of branches varies among the accessions evaluated which could be due to their genetic differences.

The other accessions produced four to five branches per plant. The eleven accessions of garden pea had statistically similar number of nodes per plant ranging from 9-13 and the number of leaves per plant ranged from 145- 211.

Table 5. Number of branches, nodes and leaves per plant of the eleven accessions of garden pea

| ACCESSION | NUMBER OF | | |
|---|---|---|---|
| | BRANCHES PER PLANT | NODE PER PLANT | LEAVES PER PLANT |
| CGP 116 | 4[b] | 22 | 207 |
| CLG | 5[b] | 23 | 197 |
| CGP 13 | 5[b] | 22 | 145 |
| CGP 59 | 4[b] | 21 | 183 |
| CGP 154 | 4[b] | 21 | 173 |
| CGP 34 | 3[a] | 23 | 206 |
| CGP 110 | 5[b] | 20 | 174 |
| Chinese Pea | 6[c] | 22 | 211 |
| CGP 11 | 4[a] | 23 | 201 |
| Betag | 3[a] | 21 | 202 |
| Taichung | 3[a] | 21 | 202 |
| CV (%) | 13.63 | 8.61 | 22.75 |

Means the same letter are not significantly different at 5% level of significance using DMRT.

Number of pods per cluster and per plant

No significant differences were noted on the number of pods per cluster. CGP 34, CGP 13, CLG and Chinese pea were double - podded (Table 6).

The number of pods per plant among the eleven accessions of garden pea evaluated did not differ significantly. Numerically, CLG followed by Chinese pea produced the highest number of pods per plant while CGP 59 produced the fewest pods per plant.

Table 6.Number of pods per cluster and pods per plant of the eleven accessions of garden pea

| ACCESSION | NUMBER OF PODS | |
|---|---|---|
| | PER CLUSTER | PER PLANT |
| CGP 116 | 1[a] | 17 |
| CLG | 2[b] | 26 |
| CGP 13 | 2[b] | 15 |
| CGP 59 | 1[a] | 12 |
| CGP 154 | 1[a] | 14 |
| CGP 34 | 2[b] | 16 |
| CGP 110 | 1[a] | 14 |
| Chinese Pea | 2[b] | 25 |
| CGP 11 | 1[a] | 20 |
| Betag | 1[a] | 19 |
| Taichung | 1[a] | 17 |
| CV (%) | 17.75 | 28.84 |

Means of the same letter are not significantly different at 5% level of significance using DMRT

Internode and tendril length

No significant differences were noted on the internode and tendril length of the accessions evaluated. Internode and tendril length ranged from 4.27 cm to 5.97 cm and 4.13 cm to 6.32 cm, respectively.

Table 7. Internode and tendril length of the eleven accessions of garden pea

| ACCESSION | INTERNODE LENGTH | TENDRIL LENGTH |
|---|---|---|
| CGP 116 | 5.21 | 4.13 |
| CLG | 5.72 | 4.52 |
| CGP 13 | 5.94 | 4.62 |
| CGP 59 | 5.33 | 4.81 |
| CGP 154 | 5.97 | 4.63 |
| CGP 34 | 5.22 | 4.39 |
| CGP 110 | 5.94 | 5.43 |
| Chinese Pea | 4.66 | 5.40 |
| CGP 11 | 4.83 | 4.50 |
| Betag | 5.46 | 6.32 |
| Taichung | 4.27 | 5.71 |
| CV (%) | 12.49 | 1.54 |

Plant height at 35, 45 and 90 DAP

There are no significant differences observed on plant height at different period among the eleven accessions of garden pea evaluated except at 35 DAP. Furthermore, there was an increasing height measurement from 35, 45 and 90 days after planting as shown on Table 8.

Table 8. Plant height at 35, 45, 90 DAP of the eleven accessions of garden pea

| ACCESSION | PLANT HEIGHT | | |
|---|---|---|---|
| | 35 DAP | 45 DAP | 90 DAP |
| CGP 116 | 34.33[b] | 55.90 | 129.90 |
| CLP | 34.06[b] | 59.06 | 132.53 |
| CGP 13 | 40.06[c] | 67.36 | 129.96 |
| CGP 59 | 40.10[c] | 62.30 | 140.96 |
| CGP 154 | 40.20[c] | 59.93 | 128.96 |
| CGP 34 | 35.50[bc] | 60.50 | 136.66 |
| CGP 110 | 35.2[bc] | 58.66 | 130.20 |
| Chinese Pea | 31.83[b] | 51.93 | 143.80 |
| CGP 11 | 34.83[b] | 56.36 | 129.16 |
| Betag | 32.60[b] | 57.56 | 130.23 |
| Taichung | 24.20[a] | 45.50 | 142.06 |
| CV (%) | 16.01 | 13.69 | 6.18 |

Pod width, length and number of seeds per pod

No significant differences were noted on the length and width of pods of garden pea accessions evaluated. Pod length and width ranged from 7.78 cm to 9.71 cm and 1.45 cm to 1.85 cm, respectively (Table 9).

CGP 116 had nine seeds per pod and Chinese pea had six seeds per pod. The other accessions had 7 to 8 seeds per pod. This could be due to varietal differences of the accessions evaluated and may serve as criteria for selection. Pod width was considered the most efficient character to use for indirect selection because it can be measured

Table 9. Pod length and width and number of seeds per pod of the eleven accessions of garden pea

| ACCESSION | POD LENGTH | POD WIDTH | NUMBER OF SEEDS PER POD |
|---|---|---|---|
| CGP 116 | 7.78 | 1.55 | 9[c] |
| CLG | 8.19 | 1.45 | 7[a] |
| CGP 13 | 9.71 | 1.85 | 7[a] |
| CGP 59 | 8.39 | 1.57 | 7[a] |
| CGP 154 | 8.24 | 1.61 | 7[a] |
| CGP 34 | 8.37 | 1.63 | 8[b] |
| CGP 110 | 8.47 | 1.62 | 7[a] |
| Chinese Pea | 7.83 | 1.46 | 6[a] |
| CGP 11 | 9.04 | 1.59 | 7[a] |
| Betag | 9.20 | 1.73 | 7[a] |
| Taichung | 8.27 | 1.60 | 8[b] |
| CV (%) | 9.80 | 9.27 | 9.46 |

without regard to number of seeds per pod and is faster to measure than pod length (Miles, 2010).

Leaflet length and width

No significant differences were noted on the leaflet length and width of the accessions evaluated which ranged from 5.92 cm to 7.66 cm and 3.48 cm and 4.49 cm, respectively (Table 10).

Table 10. Leaflet length and width of the eleven accessions of garden pea

| ACCESSION | LEAFLET (cm) | |
|---|---|---|
| | LENGTH | WIDTH |
| CGP 116 | 7.33 | 4.10 |
| CLG | 5.92 | 3.48 |
| CGP 13 | 7.66 | 4.49 |
| CGP 59 | 7.36 | 4.06 |
| CGP 154 | 7.3 | 4.24 |
| CGP 34 | 7.27 | 4.05 |
| CGP 110 | 7.34 | 4.10 |
| Chinese Pea | 6.96 | 4.05 |
| CGP 11 | 7.09 | 4.06 |
| Betag | 6.95 | 3.77 |
| Taichung | 6.3 | 3.94 |
| CV (%) | 10.42 | 11.59 |

Leaf miner and Powdery Mildew Incidence

All the eleven accessions of garden pea showed high resistance to leaf miner and powdery mildew except for Betag which was moderately resistant to powdery mildew.

Fresh pod yield per plot

Table 11 shows that there were no significant differences in the fresh pod yield per plot of the garden pea accessions evaluated. The marketable fresh pod yield per plot

Table 11. Fresh pod yield of the eleven accessions of garden pea

| ACCESSION | FRESH POD YIELD (kg/5m$^2$) | | |
|---|---|---|---|
| | MARKETABLE | NON-MARKETABLE | TOTAL |
| CGP 116 | 1.22 | 1.14 | 2.36 |
| CLG | 1.11 | 0.58 | 1.69 |
| CGP 13 | 1.60 | 0.58 | 2.18 |
| CGP 59 | 1.21 | 0.57 | 1.78 |
| CGP 154 | 1.25 | 0.58 | 1.83 |
| CGP 34 | 1.62 | 0.54 | 2.17 |
| CGP 110 | 1.02 | 0.52 | 1.54 |
| Chinese Pea | 1.30 | 0.55 | 1.86 |
| CGP 11 | 1.16 | 0.61 | 1.77 |
| Betag | 1.01 | 0.46 | 1.47 |
| Taichung | 0.79 | 0.45 | 1.25 |
| CV (%) | 26.57 | 20.14 | 22.23 |

ranged from 0.79 to 1.12 kg/5m$^2$ while the non-marketable yield per plot ranged from 0.45- 1.14 kg/5m$^2$. The total yield ranged from 1.25 to 2.36 kg/5m $^2$.

Leaf, Flower, and Pod Characteristics

Table 12 shows the qualitative characters of the garden pea evaluated. CLG, Chinese pea and Taichung had light green leaf while the other accessions had green

leaves. All accessions were observed to have purple flowers except for CLG and Chinese pea which had white flowers. CGP 116, CGP 34 and Chinese pea had dark colored pods Pod shape were observed to be flat and curved. CGP 13, CGP 59, CGP 154, Betag, and Taichung had curved pods and the other accessions had straight pods. All garden pea accessions were observed to have stringy pods. CLG, CGP 13 and CGP 11 had waxy and shiny pods and the other accessions had non- waxy and dull pods.

Diversity Indices (H')

The indices for the quantitative characters ranged from 0.13 for weight of non marketable fresh pods to 0.58 for number of days from pod setting to pod maturity. (Table 13).

Table 14 presents the diversity indices for qualitative characters gathered from the eleven accessions of garden pea. Diversity indices ranged from 0.72 to 0.98. Results showed that there is high variation among the characters.

Pooling of diversity values for both the quantitative and qualitative characters gave an overall diversity index of 0.65 in the collection. This indicates low variability among the eleven accessions evaluated which are good characters of parents in making crosses to develop better varieties and they can be used as indices of selection. Diversity indices for qualitative characters were high so the garden pea accessions are good parents in developing varieties that would improve qualities.

Table 12. Color of leaves and flowers and pod characteristics of eleven accessions of garden pea

| | LEAF | FLOWER | POD CHARACTERS | | | | | |
|---|---|---|---|---|---|---|---|---|
| ACCESSIONS | COLOR | COLOR | COLOR | SHAPE | STRAIGHTNES | STRINGINES | WAXINESS | SHININESS |
| CGP 116 | Green | Purple | Dark green | Flat | Straight | Stringy | Non-waxy | Dull |
| CLG | Light Green | White | Green | Flat | Straight | Stringy | Waxy | Shiny |
| CGP 13 | Green | Purple | Green | Flat | Curve | Stringy | Waxy | Shiny |
| CGP 59 | Green | Purple | Green | Curve | Curve | Stringy | Non-Waxy | Dull |
| CGP 154 | Green | Purple | Green | Curve | Curve | Stringy | Non-Waxy | Dull |
| CGP 34 | Green | Purple | Dark Green | Flat | Straight | Stringy | Non-Waxy | Dull |
| CGP 110 | Green | Purple | Dark Green | Flat | Straight | Stringy | Non-Waxy | Dull |
| Chinese Pea | Light Green | White | Dark Green | Flat | Straight | Stringy | Non-Waxy | Dull |
| CGP 11 | Green | Purple | Green | Flat | Straight | Stringy | Waxy | Shiny |
| Betag | Green | Purple | Green | Curve | Curve | Stringy | Non-waxy | Dull |
| Taichung | Light Green | Purple | Green | Curve | Curve | Stringy | Non-waxy | Dull |

Table 13. Diversity indices (H') for the quantitative characters of eleven accessions of garden pea

| CHARACTER | H' |
|---|---|
| Number of days from sowing to emergence | 0.53 |
| Number of days from emergence to first flowering | 0.54 |
| Number of days from emergence to last flowering | 0.48 |
| Number of days from emergence to pod setting | 0.39 |
| Number of days from emergence to pod setting | 0.53 |
| Number of days from emergence to first harvesting | 0.39 |
| Number of days from emergence to last harvesting | 0.20 |
| Number of days from pod setting to pod maturity | 0.58 |
| Number of nodes per plant | 0.53 |
| Node number bearing first flower cluster | 0.36 |
| Number of flower per plant | 0.36 |
| Number of flower cluster per plant | 0.48 |
| Node number bearing first pod | 0.48 |
| Number of leaves per plant | 0.43 |
| Node number bearing last pod | 0.39 |
| Number of branches | 0.47 |
| Number of flowers per cluster | 0.42 |
| Number of pods per cluster | 0.43 |
| Number of pods per plant | 0.42 |
| Number of seeds per pod | 0.44 |
| Leaflet length | 0.43 |
| Leaflet Width | 0.49 |
| Tendril Length | 0.47 |
| Plant Height at 35 DAP | 0.47 |
| Internode length | 0.53 |
| Final plant height at maturity | 0.54 |
| Pod length | 0.38 |
| Pod width | 0.47 |
| Plant height at flowering | 0.52 |
| Weight of marketable fresh pod per plot | 0.56 |
| Weight of non - marketable fresh pod per plot | 0.13 |
| Total yield per plot | 0.54 |
| Mean Diversity Index | 0.41 |

Table 14. Diversity indices for the qualitative characters of eleven accessions of garden pea

| CHARACTER | H' |
|---|---|
| Leaf color | 0.72 |
| Flower color | 0.83 |
| Pod color | 0.90 |
| Pod shape | 0.95 |
| Waxiness of pod | 0.97 |
| Shininess of pod | 0.98 |
| Mean Diversity Index | 0.89 |

Cluster Analysis

The cluster analysis conducted on the 32 qualitative characters of the eleven garden pea accessions formed four distinct clusters (Figures 1 and 2). CGP 11, CGP 34, CGP 116 and CLG were the first cluster formed, which were early maturing accessions with many nodes and branches. They also had wide pods with many seeds. Chinese, Betag, Taichung comprises the second cluster which bore flower and first pod at lower nodes, had numerous flowers per plant, flowers per cluster and flower clusters per plant. They had long internodes and tendrils, shortest at flowering but tallest at maturity with least non – marketable fresh pod yield and long harvesting period. CGP 13 is the only accession in the third cluster which was high yielding accessions which emerged early to flowering, flowering to pod setting, and to first and last harvesting. It had wide leaves, tall at 35 DAP and had numerous long pods per cluster. CGP 59, CGP 110, CGP 154 comprised the fourth cluster that had early emergence to pod setting. The accessions studied showed high variation among the clusters.

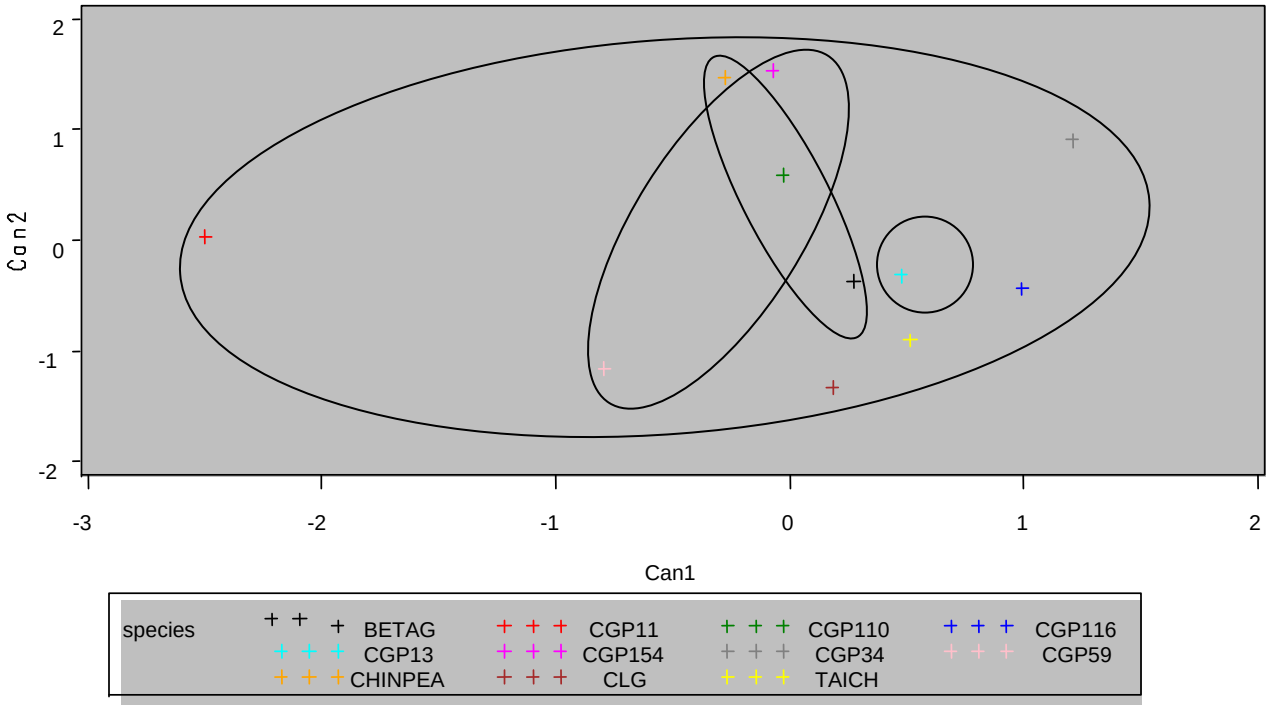


Figure 1. Cluster analysis of eleven accessions of garden pea using WARD's method

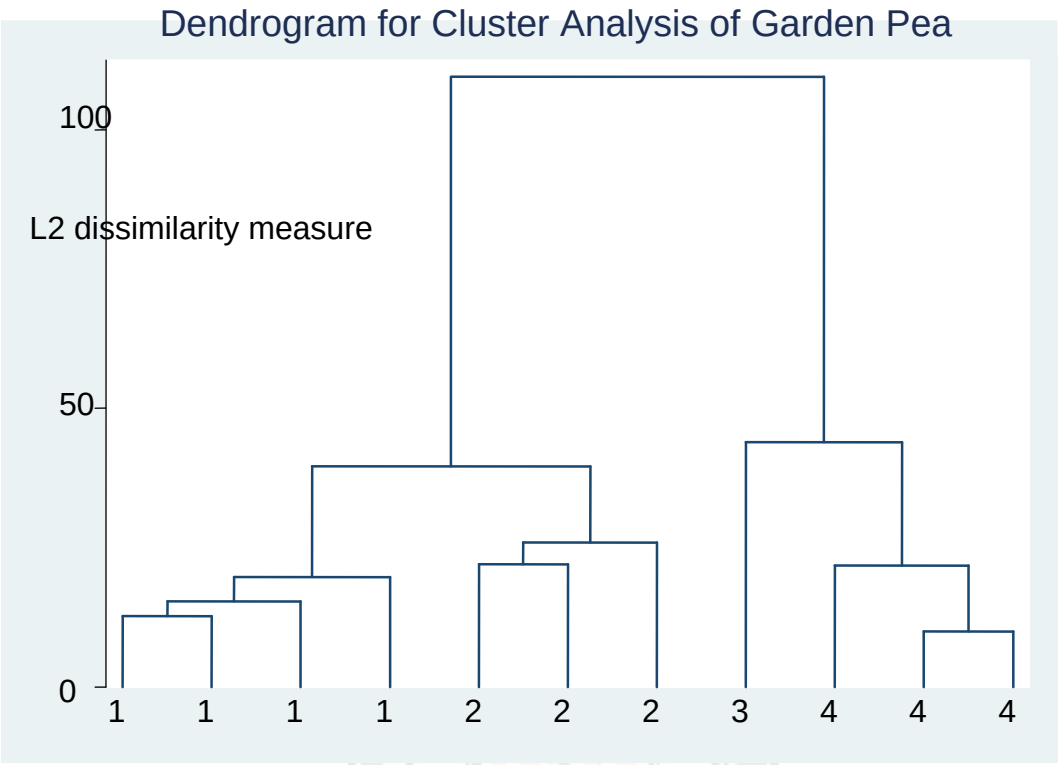


Figure 2. Dendogram produced from cluster analysis of eleven accessions of garden pea

## SUMMARY, CONCLUSION AND RECOMMENDATION

Summary

The eleven accessions of garden pea were characterized to estimate variation among them through diversity and cluster analysis.

The eleven accessions of garden pea evaluated emerged in 7 to 8 days after sowing, flowered from 43 to 54 days after emergence, took 46 to 58 days from sowing to pod setting and 3 to 7 days from pod setting to pod maturity.

The garden pea accession observed to produce first flower was CGP 13 while Taichung was the latest at 54 days after emergence.CGP 34, Betag, CGP 13, CLG and Chinese pea had two flowers per cluster while the other cluster had only one flower. The accessions were observed to produce 3 to 6 branches. The number of nodes per plant recorded ranged from 20 to 23 and the number of leaves per plant was from 145 to 211. The leaflet length varied from 5.92 cm to 7.66 cm. Pod width ranged from 1.45 cm to 1.85 cm. Internode and tendril length measured from 4.27 cm to 5.97 cm and 4.13 cm to 6.32 cm, respectively. Plant height did not differ significantly although there is an increase in measurement from 35, 45 and 90 days after planting.

The marketable and non-marketable fresh pod yield per plot of the eleven accession of garden pea ranged from 0.79 kg to 1.62 kg and non-marketable fresh pod yield ranged from 0.45 kg to 1.14 kg respectively. The total yield of garden pea ranged from 1.25 kg (Taichung) to 2.18 (CGP 13).

The eleven accessions of garden pea varied in qualitative characters. They had light green and green leaves. All of them had purple flowers except for CLG and Chinese

pea which had white flowers. They had green to dark green stringy pods that were either flat, curve or straight which were either waxy or non-waxy and shiny or dull.

CGP 11, CGP 34, CGP 116 and CLG were the first cluster formed, which were early maturing accessions with many nodes and branches. They also had wide numerous pod seeds. Chinese, Betag, Taichung comprises the second cluster which bore flower and first pod at lower nodes, had numerous flowers per plant, flowers per cluster and flower clusters per plant. They had long internodes and tendrils, shortest at flowering but tallest at maturity with least non – marketable fresh pod yield and long harvesting period. CGP 13 is the only accession in the third cluster which was high yielding accessions which emerged early to flowering, flowering to pod setting, and to first and last harvesting. It had wide leaves, tall at 35 DAP and had numerous long pods per cluster. CGP 59, CGP 110, CGP 154 comprised the fourth cluster that had early emergence to pod setting. The accessions studied showed high variation among the clusters.

The diversity analysis revealed low variations within the collection of accession of garden pea evaluated. The diversity indices (H') for the quantitative characters ranged from 0.13 to 0.58. The diversity indices for qualitative characters of the eleven accessions ranged from 0.72 to 0.98. Pooling of diversity values for both the quantitative and qualitative characters gave an overall diversity index of 0.65 in the collection. This indicates low variability among the eleven accessions evaluated which are good characters of parents in making crosses to develop better varieties and they can be used as indices of selection. Diversity indices for qualitative characters were high so the garden pea accessions are good parents in developing varieties that would improve qualities.

Conclusion

The eleven accessions significantly differed in the agromorphological characters observed in this study.

CGP 13, Chinese pea, and CGP 34 were among the accessions that produced flowers and pods earlier. CGP 116, on the other hand, produced the highest number of seeds per pod and total fresh pod yield. `

The diversity indices for the quantitative characters ranged from 0.13 to 58. The characters that had high diversity index were number of days from sowing to emergence (0.53), number of days from emergence to first flowering (0.54), number of days from emergence to pod setting (0.53), number of days from pod setting to pod maturity (0.58), number of nodes per plant (0.53), internode length (0.53), plant height at flowering (0.52), plant height at maturity (0.54), weight of marketable fresh pods per plot (0.52), and total yield per plot. Diversity indices for qualitative characters ranged from 0.72 to 0.98 with a mean of 0.89. This indicates low variation among the quantitative characters measured.

Cluster analysis revealed four clusters among the eleven accessions of garden pea. The first cluster included CGP 11, CGP 34, CGP 116 and CLG which were found to be early maturing accessions with many nodes and branches, had wide numerous pod seeds. Chinese pea, Betag, Taichung formed the second cluster that bore first flower and pod at lower nodes, had numerous flowers, long internodes and tendrils, shortest at flowering but tallest at maturity with least non – marketable yield and long harvesting period. CGP 13 was the only accession on the third distinct cluster which was high yielding, emerged early to flowering, first and last harvesting and pod setting. It had big

leaves and tall at 35 DAP and has numerous and long pods per cluster; CGP 59, CGP 110, CGP 154 comprised the fourth cluster that had early emergence to pod setting. The accessions studied showed low variation among the clusters.

Recommendation

The high variation found in the agromorphological characters observed in this study among the accessions in the collection could be used to start a breeding program. These characters may also be subjected for further evaluation and selection to release new and improved varieties of garden pea.

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# APPENDICES

Appendix Table 1. Number of days from sowing to emergence

| TREATMENT | BLOCK | | | | |
|---|---|---|---|---|---|
| | I | II | III | TOTAL | MEAN |
| CGP 116 | 8 | 7 | 7 | 22 | 7.33[a] |
| CLG | 7 | 8 | 6 | 21 | 7.00[a] |
| CGP 13 | 7 | 8 | 7 | 22 | 7.33[a] |
| CGP 59 | 7 | 7 | 7 | 21 | 7.00[a] |
| CGP 154 | 7 | 7 | 7 | 21 | 7.00a |
| CGP 34 | 6 | 6 | 8 | 20 | 6.67[a] |
| CGP 110 | 7 | 8 | 7 | 22 | 7.03[a] |
| Chinese Pea | 7 | 7 | 7 | 21 | 7.00[a] |
| CGP 11 | 7 | 7 | 8 | 22 | 7.33[a] |
| Betag | 6 | 6 | 8 | 20 | 6.67[a] |
| Taichung | 8 | 8 | 8 | 24 | 8.00a |
| TOTAL | 77 | 79 | 80 | | |

ANALYSIS OF VARIANCE

| SOURCE OF VARIATION | DEGREES OF FREEDOM | SUM OF SQUARES | MEAN OF SQUARES | COMPUTED F | TABULATED F | |
|---|---|---|---|---|---|---|
| | | | | | 0.05 | 0.01 |
| Treatment | 10 | 4.240 | 0.420 | | | |
| Block | 2 | 0.420 | 0.212 | 0.44 | 2.35 | 3.37 |
| Error | 20 | 9.580 | 0.479 | | | |
| TOTAL | 32 | 14.240 | | | | |

ns – not significant CV (%) = 9.68%

Appendix Table 2. Number of days from emergence to flowering.

| TREATMENT | BLOCK | | | TOTAL | MEAN |
|---|---|---|---|---|---|
| | I | II | III | | |
| CGP 116 | 42 | 42 | 50 | 134 | 44.67[c] |
| CLG | 45 | 48 | 45 | 138 | 46.00[c] |
| CGP 13 | 43 | 43 | 43 | 129 | 43.00[d] |
| CGP 59 | 45 | 45 | 45 | 135 | 45.00[c] |
| CGP 154 | 48 | 48 | 48 | 144 | 48.00[b] |
| CGP 34 | 45 | 54 | 48 | 147 | 49.00[b] |
| CGP 110 | 47 | 46 | 46 | 139 | 46.33[c] |
| Chinese Pea | 45 | 45 | 57 | 147 | 49.00[b] |
| CGP 11 | 46 | 48 | 46 | 147 | 46.67[c] |
| Betag | 40 | 50 | 45 | 140 | 45.00[c] |
| Taichung | 48 | 57 | 57 | 135 | 54.00[a] |
| TOTAL | 494 | 526 | 530 | 162 | |

ANALYSIS OF VARIANCE

| SOURCE OF VARIATION | DEGREES OF FREEDOM | SUM OF SQUARES | MEAN OF SQUARES | COMPUTED F | TABULATED F | |
|---|---|---|---|---|---|---|
| | | | | | 0.05 | 0.01 |
| Treatment | 10 | 2.66.670 | 26.297 | | | |
| Block | 2 | 70.790 | 35.394 | 3.17 | 2.35 | 3.37 |
| Error | 20 | 223.210 | 11.161 | | | |
| TOTAL | 32 | 560.970 | | | | |

ns – not significant CV (%) = 7.11%

Appendix Table 3. Number of days from emergence to last flowering.

| TREATMENT | BLOCK | | | TOTAL | MEAN |
|---|---|---|---|---|---|
| | I | II | III | | |
| CGP 116 | 92 | 92 | 92 | 276 | 92[d] |
| CLG | 94 | 94 | 96 | 284 | 94[c] |
| CGP 13 | 94 | 96 | 94 | 284 | 94[c] |
| CGP 59 | 96 | 96 | 96 | 288 | 96[b] |
| CGP 154 | 94 | 96 | 94 | 284 | 94[c] |
| CGP 34 | 96 | 96 | 96 | 288 | 96[b] |
| CGP 110 | 94 | 94 | 96 | 284 | 94[c] |
| Chinese Pea | 96 | 98 | 96 | 290 | 96[b] |
| CGP 11 | 94 | 94 | 94 | 284 | 94[c] |
| Betag | 96 | 98 | 94 | 288 | 96[b] |
| Taichung | 96 | 100 | 98 | 294 | 98[d] |
| TOTAL | 1,042 | 1,054 | 1,046 | | |

ANALYSIS OF VARIANCE

| SOURCE OF VARIATION | DEGREES OF FREEDOM | SUM OF SQUARES | MEAN OF SQUARES | COMPUTED F | TABULATED F | |
|---|---|---|---|---|---|---|
| | | | | | 0.05 | 0.01 |
| Treatment | 10 | 74.180 | 7.418 | | | |
| Block | 2 | 6.790 | 3.394 | 3.01 | 2.35 | 3.37 |
| Error | 20 | 22.550 | 1.127 | | | |
| TOTAL | 32 | 103.520 | | | | |

ns – not significant CV (%) = 1.

Appendix Table 4. Number of days from emergence to pod setting.

| TREATMENT | BLOCK | | | TOTAL | MEAN |
|---|---|---|---|---|---|
| | I | II | III | | |
| CGP 116 | 50 | 42 | 52 | 144 | 48[b] |
| CLG | 49 | 48 | 45 | 142 | 47[b] |
| CGP 13 | 49 | 49 | 49 | 147 | 49[b] |
| CGP 59 | 48 | 45 | 47 | 140 | 46a |
| CGP 154 | 47 | 48 | 57 | 152 | 50b |
| CGP 34 | 58 | 54 | 47 | 159 | 53[bc] |
| CGP 110 | 56 | 46 | 46 | 148 | 49[b] |
| Chinese Pea | 47 | 45 | 47 | 139 | 46[a] |
| CGP 11 | 58 | 48 | 58 | 164 | 54[c] |
| Betag | 47 | 50 | 52 | 149 | 49[b] |
| Taichung | 62 | 57 | 57 | 176 | 58[d] |
| TOTAL | 569 | 526 | | | |

ANALYSIS OF VARIANCE

| SOURCE OF VARIATION | DEGREES OF FREEDOM | SUM OF SQUARES | MEAN OF SQUARES | COMPUTED F | TABULATED F | |
|---|---|---|---|---|---|---|
| | | | | | 0.05 | 0.01 |
| Treatment | 10 | 427.640 | 42.764 | | | |
| Block | 2 | 70.970 | 35.485 | 2.48 | 2.35 | 3.37 |
| Error | 20 | 268.360 | 14.318 | | | |
| TOTAL | 32 | 784.970 | | | | |

ns – not significant CV (%) = 7.52%

Appendix Table 5. Number of days from flowering to pod setting.

| TREATMENT | BLOCK | | | | |
|---|---|---|---|---|---|
| | I | II | III | TOTAL | MEAN |
| CGP 116 | 8 | 7 | 9 | 23 | 7[a] |
| CLG | 7 | 7 | 9 | 23 | 8[b] |
| CGP 13 | 6 | 6 | 6 | 18 | 6[a] |
| CGP 59 | 8 | 8 | 9 | 25 | 8[b] |
| CGP 154 | 8 | 8 | 9 | 25 | 8[b] |
| CGP 34 | 13 | 12 | 13 | 38 | 13[c] |
| CGP 110 | 9 | 7 | 7 | 23 | 8[b] |
| Chinese Pea | 7 | 7 | 15 | 29 | 10[b] |
| CGP 11 | 10 | 15 | 12 | 37 | 12[c] |
| Betag | 7 | 7 | 7 | 21 | 7[c] |
| Taichung | 14 | 13 | 13 | 40 | 13[a] |
| TOTAL | 107 | 108 | 116 | | |

ANALYSIS OF VARIANCE

| SOURCE OF VARIATION | DEGREES OF FREEDOM | SUM OF SQUARES | MEAN OF SQUARES | COMPUTED F | TABULATED F | |
|---|---|---|---|---|---|---|
| | | | | | 0.05 | 0.01 |
| Treatment | 10 | 356.970 | 35.697 | | | |
| Block | 2 | 4.420 | 2.212 | 0.72 | 2.35 | 3.37 |
| Error | 20 | 61.580 | 3.079 | | | |
| TOTAL | 32 | 422.970 | | | | |

ns – not significant CV (%) =17.49

Appendix Table 6. Number of days from emergence to first harvesting

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| TREATMENT | BLOCK | | | TOTAL | MEAN |
|---|---|---|---|---|---|
| | I | II | III | | |
| CGP 116 | 64 | 64 | 64 | 192 | 64[c] |
| CLG | 60 | 60 | 60 | 180 | 60[a] |
| CGP 13 | 60 | 60 | 60 | 180 | 60[a] |
| CGP 59 | 62 | 66 | 60 | 184 | 62[b] |
| CGP 154 | 61 | 60 | 64 | 186 | 61[b] |
| CGP 34 | 64 | 64 | 66 | 194 | 64[c] |
| CGP 110 | 60 | 60 | 60 | 180 | 60[a] |
| Chinese Pea | 60 | 60 | 60 | 180 | 60[a] |
| CGP 11 | 64 | 64 | 64 | 192 | 64[c] |
| Betag | 60 | 60 | 60 | 180 | 60[a] |
| Taichung | 66 | 66 | 66 | 196 | 66[d] |
| TOTAL | 678 | 648 | 684 | | |

ANALYSIS OF VARIANCE

| SOURCE OF VARIATION | DEGREES OF FREEDOM | SUM OF SQUARES | MEAN OF SQUARES | COMPUTED F | TABULATED F | |
|---|---|---|---|---|---|---|
| | | | | | 0.05 | 0.01 |
| Treatment | 10 | 154.670 | 15.467 | | | |
| Block | 2 | 2.180 | 1.091 | 0.62 | 2.35 | 3.37 |
| Error | 20 | 35.150 | 1.758 | | | |
| TOTAL | 32 | 192.000 | | | | |

ns – not significant CV (%) = 2.14

Appendix Table 7. Number of days from emergence to last harvesting.

| TREATMENT | BLOCK | | | TOTAL | MEAN |
|---|---|---|---|---|---|
| | I | II | III | | |
| CGP 116 | 93 | 93 | 93 | 279 | 93 |
| CLG | 93 | 93 | 93 | 279 | 93 |
| CGP 13 | 93 | 93 | 93 | 279 | 93 |
| CGP 59 | 90 | 90 | 90 | 270 | 90 |
| CGP 154 | 93 | 93 | 93 | 279 | 93 |
| CGP 34 | 90 | 90 | 90 | 270 | 90 |
| CGP 110 | 93 | 93 | 93 | 279 | 93 |
| Chinese Pea | 93 | 93 | 93 | 279 | 93 |
| CGP 11 | 93 | 93 | 93 | 279 | 93 |
| Betag | 93 | 93 | 93 | 279 | 93 |
| Taichung | 93 | 93 | 93 | 279 | 93 |
| TOTAL | 1017 | 1017 | 1017 | | |

ANALYSIS OF VARIANCE

| SOURCE OF VARIATION | DEGREES OF FREEDOM | SUM OF SQUARES | MEAN OF SQUARES | COMPUTED F | TABULATED F | |
|---|---|---|---|---|---|---|
| | | | | | 0.05 | 0.01 |
| Treatment | 10 | 44.180 | 4.418 | | | |
| Block | 2 | 0.000 | 0.000 | 0.00 | 2.35 | 3.37 |
| Error | 20 | 0.000 | 0.000 | | | |
| TOTAL | 32 | 44.180 | | | | |

ns – not significant CV (%) = 0.00

Appendix Table 8. Number of days from pod setting to pod maturity

| TREATMENT | BLOCK | | | | |
|---|---|---|---|---|---|
| | I | II | III | TOTAL | MEAN |
| CGP 116 | 4 | 4 | 3 | 11 | 4 |
| CLG | 6 | 6 | 6 | 18 | 6 |
| CGP 13 | 7 | 9 | 6 | 22 | 7 |
| CGP 59 | 6 | 9 | 7 | 22 | 7 |
| CGP 154 | 7 | 6 | 8 | 21 | 7 |
| CGP 34 | 6 | 5 | 7 | 18 | 6 |
| CGP 110 | 8 | 7 | 5 | 20 | 7 |
| Chinese Pea | 3 | 2 | 4 | 9 | 3 |
| CGP 11 | 6 | 8 | 4 | 18 | 6 |
| Betag | 6 | 6 | 6 | 18 | 6 |
| Taichung | 4 | 9 | 9 | 22 | 7 |
| TOTAL | 63 | 71 | 65 | | |

ANALYSIS OF VARIANCE

| SOURCE OF VARIATION | DEGREES OF FREEDOM | SUM OF SQUARES | MEAN OF SQUARES | COMPUTED F | TABULATED F | |
|---|---|---|---|---|---|---|
| | | | | | 0.05 | 0.01 |
| Treatment | 10 | 63.636 | 6.364 | | | |
| Block | 2 | 3.152 | 1.576 | 3.02* | 2.35 | 3.37 |
| Error | 20 | 42.182 | 2.109 | | | |
| TOTAL | 32 | 108.970 | | | | |

*= significant CV (%) = 24.08%

Appendix Table 9. Number of nodes per plant.

| TREATMENT | BLOCK | | | | |
|---|---|---|---|---|---|
| | I | II | III | TOTAL | MEAN |
| CGP 116 | 24 | 24 | 20 | 68 | 23 |
| CLG | 23 | 23 | 22 | 69 | 23 |
| CGP 13 | 24 | 22 | 19 | 66 | 22 |
| CGP 59 | 23 | 20 | 19 | 64 | 21 |
| CGP 154 | 23 | 21 | 21 | 65 | 21 |
| CGP 34 | 24 | 22 | 24 | 71 | 23 |
| CGP 110 | 21 | 21 | 19 | 62 | 20 |
| Chinese Pea | 23 | 20 | 22 | 67 | 22 |
| CGP 11 | 22 | 21 | 27 | 69 | 23 |
| Betag | 22 | 20 | 20 | 63 | 21 |
| Taichung | 25 | 20 | 19 | 64 | 21 |
| TOTAL | 256 | 236 | 237 | | |

ANALYSIS OF VARIANCE

| SOURCE OF VARIATION | DEGREES OF FREEDOM | SUM OF SQUARES | MEAN OF SQUARES | COMPUTED F | TABULATED F | |
|---|---|---|---|---|---|---|
| | | | | | 0.05 | 0.01 |
| Treatment | 10 | 24.780 | 2.418 | | | |
| Block | 2 | 23.060 | 11.531 | 3.18 | 2.35 | 3.37 |
| Error | 20 | 72.480 | 3.624 | | | |
| TOTAL | 32 | 120.330 | | | | |

ns – not significant CV (%) = 8.61

Appendix Table 10. Node number bearing first flower cluster

| TREATMENT | BLOCK | | | | |
|---|---|---|---|---|---|
| | I | II | III | TOTAL | MEAN |
| CGP 116 | 10 | 16 | 10 | 36 | 12 |
| CLG | 13 | 11 | 13 | 37 | 12 |
| CGP 13 | 11 | 9 | 9 | 29 | 10 |
| CGP 59 | 11 | 11 | 16 | 38 | 13 |
| CGP 154 | 11 | 11 | 14 | 36 | 12 |
| CGP 34 | 14 | 13 | 10 | 37 | 12 |
| CGP 110 | 18 | 8 | 9 | 35 | 12 |
| Chinese Pea | 7 | 8 | 11 | 26 | 9 |
| CGP 11 | 11 | 11 | 12 | 34 | 11 |
| Betag | 9 | 8 | 13 | 30 | 10 |
| Taichung | 10 | 9 | 10 | 29 | 10 |
| TOTAL | 124 | 113 | 125 | | |

ANALYSIS OF VARIANCE

| SOURCE OF VARIATION | DEGREES OF FREEDOM | SUM OF SQUARES | MEAN OF SQUARES | COMPUTED F | TABULATED F | |
|---|---|---|---|---|---|---|
| | | | | | 0.05 | 0.01 |
| Treatment | 10 | 50.180 | 5.018 | | | |
| Block | 2 | 6.540 | 3.269 | 0.44 | 2.35 | 3.37 |
| Error | 20 | 148.500 | 7.425 | | | |
| TOTAL | 32 | 205.220 | | | | |

ns – not significant CV (%) = 24.15%

Appendix Table 11. Node number bearing first pod

| TREATMENT | BLOCK | | | TOTAL | MEAN |
|---|---|---|---|---|---|
| | I | II | III | | |
| CGP 116 | 10 | 16 | 10 | 36 | 12 |
| CLG | 13 | 11 | 13 | 37 | 12 |
| CGP 13 | 11 | 9 | 9 | 29 | 10 |
| CGP 59 | 11 | 11 | 16 | 38 | 13 |
| CGP 154 | 11 | 11 | 14 | 36 | 12 |
| CGP 34 | 14 | 13 | 10 | 37 | 12 |
| CGP 110 | 18 | 8 | 9 | 35 | 12 |
| Chinese Pea | 7 | 8 | 11 | 26 | 9 |
| CGP 11 | 11 | 11 | 12 | 34 | 11 |
| Betag | 9 | 8 | 13 | 30 | 10 |
| Taichung | 10 | 9 | 10 | 29 | 10 |
| TOTAL | 124 | 113 | 125 | | |

ANALYSIS OF VARIANCE

| SOURCE OF VARIATION | DEGREES OF FREEDOM | SUM OF SQUARES | MEAN OF SQUARES | COMPUTED F | TABULATED F | |
|---|---|---|---|---|---|---|
| | | | | | 0.05 | 0.01 |
| Treatment | 10 | 50.180 | 5.018 | | | |
| Block | 2 | 6.540 | 3.269 | 0.44 | 2.35 | 3.37 |
| Error | 20 | 148.500 | 7.425 | | | |
| TOTAL | 32 | 205.220 | | | | |

ns – not significant CV (%) = 24.15%

Appendix Table 12. Node number bearing last pod

| TREATMENT | BLOCK | | | | |
|---|---|---|---|---|---|
| | I | II | III | TOTAL | MEAN |
| CGP 116 | 23 | 22 | 18 | 64 | 21 |
| CLG | 22 | 22 | 21 | 67 | 22 |
| CGP 13 | 23 | 21 | 18 | 63 | 21 |
| CGP 59 | 23 | 18 | 18 | 61 | 20 |
| CGP 154 | 23 | 19 | 19 | 62 | 20 |
| CGP 34 | 23 | 21 | 24 | 69 | 23 |
| CGP 110 | 19 | 20 | 17 | 57 | 19 |
| Chinese Pea | 22 | 25 | 21 | 70 | 23 |
| CGP 11 | 21 | 19 | 27 | 69 | 23 |
| Betag | 22 | 19 | 18 | 60 | 20 |
| Taichung | 26 | 27 | 16 | 70 | 23 |
| TOTAL | 253 | 239 | 222 | | |

ANALYSIS OF VARIANCE

| SOURCE OF VARIATION | DEGREES OF FREEDOM | SUM OF SQUARES | MEAN OF SQUARES | COMPUTED F | TABULATED F | |
|---|---|---|---|---|---|---|
| | | | | | 0.05 | 0.01 |
| Treatment | 10 | 67.22 | 6.722 | | | |
| Block | 2 | 42.64 | 21.318 | 3.06 | 2.35 | 3.37 |
| Error | 20 | 439.42 | 6.971 | | | |
| TOTAL | 32 | 249.28 | | | | |

ns – not significant CV (%) = 12.18%

Appendix Table 13. Number of leaves per plant

| TREATMENT | BLOCK | | | TOTAL | MEAN |
|---|---|---|---|---|---|
| | I | II | III | | |
| CGP 116 | 144 | 280 | 194 | 620 | 207 |
| CLG | 150 | 227 | 211 | 590 | 197 |
| CGP 13 | 129 | 175 | 130 | 435 | 145 |
| CGP 59 | 118 | 186 | 245 | 550 | 183 |
| CGP 154 | 193 | 178 | 147 | 518 | 172 |
| CGP 34 | 194 | 186 | 236 | 617 | 206 |
| CGP 110 | 157 | 178 | 187 | 523 | 174 |
| Chinese Pea | 168 | 159 | 303 | 631 | 211 |
| CGP 11 | 159 | 170 | 272 | 601 | 201 |
| Betag | 162 | 174 | 268 | 604 | 202 |
| Taichung | 212 | 151 | 241 | 605 | 202 |
| TOTAL | 1792 | 2067 | 2438 | | |

ANALYSIS OF VARIANCE

| SOURCE OF VARIATION | DEGREES OF FREEDOM | SUM OF SQUARES | MEAN OF SQUARES | COMPUTED F | TABULATED F | |
|---|---|---|---|---|---|---|
| | | | | | 0.05 | 0.01 |
| Treatment | 10 | 11879.060 | 1187.906 | | | |
| Block | 2 | 19108.550 | 9554.273 | 5.07 | 2.35 | 3.37 |
| Error | 20 | 37682.820 | 1884.141 | | | |
| TOTAL | 32 | 68670.420 | | | | |

ns – not significant CV (%) =22.74%

Appendix Table 14. Number of branches

| TREATMENT | BLOCK | | | TOTAL | MEAN |
|---|---|---|---|---|---|
| | I | II | III | | |
| CGP 116 | 2 | 1 | 2 | 5 | 2 |
| CLG | 3 | 2 | 1 | 6 | 3 |
| CGP 13 | 2 | 2 | 2 | 6 | 3 |
| CGP 59 | 1 | 1 | 2 | 4 | 1 |
| CGP 154 | 1 | 2 | 2 | 5 | 2 |
| CGP 34 | 1 | 1 | 1 | 3 | 1 |
| CGP 110 | 2 | 1 | 3 | 6 | 3 |
| Chinese Pea | 3 | 4 | 3 | 10 | 3 |
| CGP 11 | 2 | 1 | 1 | 4 | 1 |
| Betag | 1 | 1 | 1 | 3 | 1 |
| Taichung | 1 | 1 | 1 | 3 | 1 |
| TOTAL | 19 | 17 | 19 | | |

ANALYSIS OF VARIANCE

| SOURCE OF VARIATION | DEGREES OF FREEDOM | SUM OF SQUARES | MEAN OF SQUARES | COMPUTED F | TABULATED F | |
|---|---|---|---|---|---|---|
| | | | | | 0.05 | 0.01 |
| Treatment | 10 | 14.000 | 1.400 | | | |
| Block | 2 | 0.242 | 0.121 | 3.95** | 2.35 | 3.37 |
| Error | 20 | 7.091 | 0.355 | | | |
| TOTAL | 32 | 21.333 | | | | |

**=highly significant CV (%) = 13.63

Appendix Table 15. Number of flower per cluster

| TREATMENT | BLOCK | | | | |
|---|---|---|---|---|---|
| | I | II | III | TOTAL | MEAN |
| CGP 116 | 1 | 1 | 1 | 3 | 1 |
| CLG | 2 | 2 | 2 | 6 | 2 |
| CGP 13 | 2 | 2 | 2 | 6 | 2 |
| CGP 59 | 1 | 1 | 1 | 3 | 1 |
| CGP 154 | 1 | 1 | 1 | 3 | 1 |
| CGP 34 | 2 | 2 | 2 | 6 | 2 |
| CGP 110 | 1 | 1 | 1 | 3 | 1 |
| Chinese Pea | 2 | 2 | 2 | 6 | 2 |
| CGP 11 | 1 | 1 | 1 | 3 | 1 |
| Betag | 1 | 1 | 1 | 3 | 1 |
| Taichung | 1 | 1 | 1 | 3 | 1 |
| TOTAL | 15 | 15 | 15 | | |

ANALYSIS OF VARIANCE

| SOURCE OF VARIATION | DEGREES OF FREEDOM | SUM OF SQUARES | MEAN OF SQUARES | COMPUTED F | TABULATED F | |
|---|---|---|---|---|---|---|
| | | | | | 0.05 | 0.01 |
| Treatment | 10 | 6.85 | 0.685 | | | |
| Block | 2 | 0.00 | 0.000 | 0.00 | 2.35 | 3.37 |
| Error | 20 | 1.33 | 0.067 | | | |
| TOTAL | 32 | 8.18 | | | | |

ns – not significant CV (%) = 17.75%

Appendix Table 16. Number of flower cluster per plant

| TREATMENT | BLOCK | | | TOTAL | MEAN |
|---|---|---|---|---|---|
| | I | II | III | | |
| CGP 116 | 3 | 3 | 2 | 8 | 3 |
| CLG | 2 | 3 | 2 | 7 | 3 |
| CGP 13 | 2 | 2 | 2 | 6 | 2 |
| CGP 59 | 2 | 2 | 3 | 7 | 3 |
| CGP 154 | 2 | 2 | 2 | 6 | 2 |
| CGP 34 | 3 | 3 | 4 | 10 | 4 |
| CGP 110 | 2 | 2 | 2 | 6 | 2 |
| Chinese Pea | 3 | 4 | 3 | 10 | 4 |
| CGP 11 | 2 | 2 | 2 | 6 | 2 |
| Betag | 2 | 2 | 3 | 7 | 3 |
| Taichung | 2 | 2 | 2 | 6 | 2 |
| TOTAL | 25 | 26 | 27 | | |

ANALYSIS OF VARIANCE

| SOURCE OF VARIATION | DEGREES OF FREEDOM | SUM OF SQUARES | MEAN OF SQUARES | COMPUTED F | TABULATED F | |
|---|---|---|---|---|---|---|
| | | | | | 0.05 | 0.01 |
| Treatment | 10 | 5.66 | 0.566 | | | |
| Block | 2 | 0.08 | 0.40 | 0.36 | 2.35 | 3.37 |
| Error | 20 | 2.21 | 0.110 | | | |
| TOTAL | 32 | 7.94 | | | | |

ns – not significant CV (%) =12.20

Appendix Table 17. Number of flower per plant

| TREATMENT | BLOCK | | | | |
|---|---|---|---|---|---|
| | I | II | III | TOTAL | MEAN |
| CGP 116 | 3 | 3 | 3 | 9 | 3 |
| CLG | 6 | 6 | 6 | 18 | 6 |
| CGP 13 | 4 | 4 | 4 | 12 | 4 |
| CGP 59 | 3 | 3 | 3 | 9 | 3 |
| CGP 154 | 2 | 2 | 2 | 6 | 2 |
| CGP 34 | 8 | 8 | 8 | 24 | 8 |
| CGP 110 | 2 | 2 | 2 | 6 | 2 |
| Chinese Pea | 8 | 8 | 8 | 24 | 8 |
| CGP 11 | 2 | 2 | 2 | 6 | 2 |
| Betag | 3 | 3 | 3 | 9 | 3 |
| Taichung | 2 | 2 | 2 | 6 | 2 |
| TOTAL | 41 | 41 | 41 | | |

ANALYSIS OF VARIANCE

| SOURCE OF VARIATION | DEGREES OF FREEDOM | SUM OF SQUARES | MEAN OF SQUARES | COMPUTED F | TABULATED F | |
|---|---|---|---|---|---|---|
| | | | | | 0.05 | 0.01 |
| Treatment | 10 | 22.62 | 2.262 | | | |
| Block | 2 | 0.32 | 0.158 | 0.36 | 2.35 | 3.37 |
| Error | 20 | 8.82 | 0.441 | | | |
| TOTAL | 32 | 31.76 | | | | |

ns – not significant CV (%) = 12.20%

Appendix Table 18. Number of pods per cluster

| TREATMENT | BLOCK | | | TOTAL | MEAN |
|---|---|---|---|---|---|
| | I | II | III | | |
| CGP 116 | 1 | 1 | 1 | 3 | 1 |
| CLG | 2 | 2 | 2 | 6 | 2 |
| CGP 13 | 2 | 2 | 2 | 6 | 2 |
| CGP 59 | 1 | 1 | 1 | 3 | 1 |
| CGP 154 | 1 | 1 | 1 | 3 | 1 |
| CGP 34 | 2 | 2 | 2 | 6 | 2 |
| CGP 110 | 1 | 1 | 1 | 3 | 1 |
| Chinese Pea | 2 | 2 | 2 | 6 | 2 |
| CGP 11 | 1 | 1 | 1 | 3 | 1 |
| Betag | 1 | 1 | 1 | 3 | 1 |
| Taichung | 1 | 1 | 1 | 3 | 1 |
| TOTAL | 15 | 15 | 15 | | |

ANALYSIS OF VARIANCE

| SOURCE OF VARIATION | DEGREES OF FREEDOM | SUM OF SQUARES | MEAN OF SQUARES | COMPUTED F | TABULATED F | |
|---|---|---|---|---|---|---|
| | | | | | 0.05 | 0.01 |
| Treatment | 10 | 6.85 | 0.685 | | | |
| Block | 2 | 0.00 | 0.000 | 0.00 | 2.35 | 3.37 |
| Error | 20 | 1.33 | 0.067 | | | |
| TOTAL | 32 | 8.18 | | | | |

ns – not significant CV (%) = 17.75%

Appendix Table 19. Number of pods per plant

| TREATMENT | BLOCK | | | TOTAL | MEAN |
|---|---|---|---|---|---|
| | I | II | III | | |
| CGP 116 | 10 | 29 | 11 | 50 | 17 |
| CLG | 22 | 29 | 24 | 76 | 26 |
| CGP 13 | 17 | 16 | 11 | 44 | 15 |
| CGP 59 | 12 | 11 | 12 | 36 | 12 |
| CGP 154 | 16 | 14 | 12 | 42 | 14 |
| CGP 34 | 20 | 12 | 15 | 47 | 16 |
| CGP 110 | 15 | 14 | 12 | 42 | 14 |
| Chinese Pea | 24 | 23 | 28 | 76 | 25 |
| CGP 11 | 20 | 18 | 23 | 53 | 20 |
| Betag | 23 | 12 | 21 | 56 | 19 |
| Taichung | 26 | 16 | 10 | 52 | 17 |
| TOTAL | 207 | 196 | 180 | | |

ANALYSIS OF VARIANCE

| SOURCE OF VARIATION | DEGREES OF FREEDOM | SUM OF SQUARES | MEAN OF SQUARES | COMPUTED F | TABULATED F | |
|---|---|---|---|---|---|---|
| | | | | | 0.05 | 0.01 |
| Treatment | 10 | 591.74 | 59.174 | | | |
| Block | 2 | 33.46 | 16.728 | 0.64 | 2.35 | 3.37 |
| Error | 20 | 524.25 | 26.212 | | | |
| TOTAL | 32 | 1149.44 | | | | |

ns – not significant CV (%) = 28.84%

Appendix Table 20. Number of seeds per plant

| TREATMENT | BLOCK | | | TOTAL | MEAN |
|---|---|---|---|---|---|
| | I | II | III | | |
| CGP 116 | 8 | 8 | 8 | 24 | 9 |
| CLG | 7 | 7 | 7 | 21 | 7 |
| CGP 13 | 7 | 7 | 7 | 21 | 7 |
| CGP 59 | 7 | 8 | 5 | 20 | 7 |
| CGP 154 | 7 | 7 | 7 | 21 | 7 |
| CGP 34 | 8 | 8 | 8 | 24 | 8 |
| CGP 110 | 7 | 7 | 6 | 20 | 7 |
| Chinese Pea | 5 | 6 | 7 | 18 | 6 |
| CGP 11 | 7 | 7 | 7 | 21 | 7 |
| Betag | 7 | 5 | 7 | 19 | 7 |
| Taichung | 8 | 8 | 8 | 24 | 8 |
| TOTAL | 78 | 78 | 77 | | |

ANALYSIS OF VARIANCE

| SOURCE OF VARIATION | DEGREES OF FREEDOM | SUM OF SQUARES | MEAN OF SQUARES | COMPUTED F | TABULATED F | |
|---|---|---|---|---|---|---|
| | | | | | 0.05 | 0.01 |
| Treatment | 10 | 13.08 | 1.308 | | | |
| Block | 2 | 0.20 | 0.099 | 0.20 | 2.35 | 3.37 |
| Error | 20 | 9.87 | 0.493 | | | |
| TOTAL | 32 | 23.15 | | | | |

ns – not significant CV (%) = 9.46%

Appendix Table 21. Leaflet length(cm)

| TREATMENT | BLOCK | | | TOTAL | MEAN |
|---|---|---|---|---|---|
| | I | II | III | | |
| CGP 116 | 6.54 | 7.76 | 7.72 | 22.01 | 7.33 |
| CLG | 4.71 | 5.79 | 7.27 | 17.77 | 5.92 |
| CGP 13 | 6.75 | 7.91 | 8.34 | 23.00 | 7.66 |
| CGP 59 | 7.04 | 7.50 | 6.41 | 20.95 | 6.98 |
| CGP 154 | 6.23 | 7.55 | 8.32 | 22.01 | 7.36 |
| CGP 34 | 7.94 | 7.60 | 6.27 | 21.81 | 7.27 |
| CGP 110 | 7.53 | 7.00 | 7.49 | 22.02 | 7.34 |
| Chinese Pea | 6.67 | 6.22 | 7.99 | 20.88 | 6.96 |
| CGP 11 | 6.93 | 7.23 | 7.12 | 21.88 | 7.09 |
| Betag | 7.09 | 6.86 | 6.91 | 20.86 | 6.95 |
| Taichung | 6.45 | 5.59 | 6.91 | 18.95 | 6.31 |
| TOTAL | 73.87 | 77.01 | 80.75 | | |

ANALYSIS OF VARIANCE

| SOURCE OF VARIATION | DEGREES OF FREEDOM | SUM OF SQUARES | MEAN OF SQUARES | COMPUTED F | TABULATED F | |
|---|---|---|---|---|---|---|
| | | | | | 0.05 | 0.01 |
| Treatment | 10 | 7.55 | 0.755 | | | |
| Block | 2 | 2.16 | 1.079 | 2.01 | 2.35 | 3.37 |
| Error | 20 | 10.71 | 0.535 | | | |
| TOTAL | 32 | 20.14 | | | | |

ns – not significant CV (%) = 10.42%

Appendix Table 22. Leaflet width (cm)

| TREATMENT | BLOCK | | | TOTAL | MEAN |
|---|---|---|---|---|---|
| | I | II | III | | |
| CGP 116 | 3.48 | 4.23 | 4.60 | 12.31 | 4.10 |
| CLG | 2.70 | 3.31 | 4.44 | 10.45 | 3.48 |
| CGP 13 | 3.96 | 4.65 | 4.86 | 13.47 | 4.49 |
| CGP 59 | 4.11 | 4.54 | 3.55 | 12.2 | 4.06 |
| CGP 154 | 3.79 | 4.35 | 4.59 | 12.73 | 4.24 |
| CGP 34 | 4.34 | 4.27 | 3.55 | 12.16 | 4.05 |
| CGP 110 | 4.37 | 3.92 | 4.02 | 12.31 | 4.10 |
| Chinese Pea | 3.96 | 3.88 | 4.32 | 12.16 | 4.05 |
| CGP 11 | 3.96 | 4.11 | 4.11 | 12.17 | 4.05 |
| Betag | 4.29 | 3.17 | 3.87 | 11.33 | 3.77 |
| Taichung | 3.72 | 4.16 | 3.96 | 11.84 | 3.94 |
| TOTAL | 42.68 | 44.59 | 45.96 | | |

ANALYSIS OF VARIANCE

| SOURCE OF VARIATION | DEGREES OF FREEDOM | SUM OF SQUARES | MEAN OF SQUARES | COMPUTED F | TABULATED F | |
|---|---|---|---|---|---|---|
| | | | | | 0.05 | 0.01 |
| Treatment | 10 | 1.92 | 0.192 | | | |
| Block | 2 | 0.47 | 0.234 | 1.07 | 2.35 | 3.37 |
| Error | 20 | 4.37 | 0.219 | | | |
| TOTAL | 32 | 6.76 | | | | |

ns – not significant CV (%) =11.59%

Appendix Table 23. Tendril length(cm)

| TREATMENT | BLOCK | | | | |
|---|---|---|---|---|---|
| | I | II | III | TOTAL | MEAN |
| CGP 116 | 4 | 5 | 4 | 13 | 4.13 |
| CLG | 5 | 5 | 4 | 14 | 5.52 |
| CGP 13 | 5 | 5 | 4 | 14 | 5.62 |
| CGP 59 | 5 | 5 | 5 | 15 | 5.81 |
| CGP 154 | 5 | 5 | 4 | 14 | 5.63 |
| CGP 34 | 4 | 4 | 5 | 13 | 4.49 |
| CGP 110 | 5 | 6 | 5 | 16 | 5.53 |
| Chinese Pea | 5 | 6 | 4 | 16 | 5.40 |
| CGP 11 | 5 | 5 | 5 | 14 | 4.50 |
| Betag | 5 | 7 | 7 | 20 | 6.32 |
| Taichung | 8 | 6 | 4 | 18 | 5.71 |
| TOTAL | 56 | 64 | 51 | | |

ANALYSIS OF VARIANCE

| SOURCE OF VARIATION | DEGREES OF FREEDOM | SUM OF SQUARES | MEAN OF SQUARES | COMPUTED F | TABULATED F | |
|---|---|---|---|---|---|---|
| | | | | | 0.05 | 0.01 |
| Treatment | 10 | 2.242 | 1.121 | | | |
| Block | 2 | 15.879 | 1.588 | 3.25* | 2.35 | 3.37 |
| Error | 20 | 9.758 | 0.488 | | | |
| TOTAL | 32 | 27.879 | | | | |

*– significant CV (%) =13.80%

Appendix Table 24. Internode length(cm)

| TREATMENT | BLOCK | | | TOTAL | MEAN |
|---|---|---|---|---|---|
| | I | II | III | | |
| CGP 116 | 5.16 | 5.66 | 4.83 | 15.65 | 5.21 |
| CLG | 5.50 | 5.66 | 6.0 | 17.16 | 5.72 |
| CGP 13 | 6.33 | 6.83 | 4.66 | 17.82 | 5.94 |
| CGP 59 | 5.33 | 5.83 | 4.83 | 15.99 | 5.33 |
| CGP 154 | 6.33 | 6.10 | 5.50 | 17.93 | 5.97 |
| CGP 34 | 5.83 | 5.50 | 4.33 | 15.66 | 5.22 |
| CGP 110 | 7.33 | 6.33 | 4.16 | 17.82 | 5.94 |
| Chinese Pea | 5.33 | 4.33 | 4.33 | 13.99 | 4.66 |
| CGP 11 | 6.16 | 4.50 | 3.83 | 14.49 | 4.83 |
| Betag | 6.83 | 5.06 | 4.50 | 16.39 | 5.46 |
| Taichung | 4.66 | 3.83 | 4.33 | 12.82 | 4.27 |
| TOTAL | 64.79 | 59.63 | 51.30 | | |

ANALYSIS OF VARIANCE

| SOURCE OF VARIATION | DEGREES OF FREEDOM | SUM OF SQUARES | MEAN OF SQUARES | COMPUTED F | TABULATED F | |
|---|---|---|---|---|---|---|
| | | | | | 0.05 | 0.01 |
| Treatment | 10 | 9.50 | 0.950 | | | |
| Block | 2 | 8.42 | 4.212 | 9.52** | 2.35 | 3.37 |
| Error | 20 | 8.85 | 0.443 | | | |
| TOTAL | 32 | 26.78 | | | | |

** – highly significant CV (%) =12.49%

Appendix Table 25. Pod length (cm)

| TREATMENT | BLOCK | | | TOTAL | MEAN |
|---|---|---|---|---|---|
| | I | II | III | | |
| CGP 116 | 7.55 | 7.29 | 8.51 | 23.35 | 7.78 |
| CLG | 7.87 | 9.21 | 7.49 | 24.57 | 8.19 |
| CGP 13 | 7.76 | 11.36 | 10.02 | 24.46 | 8.15 |
| CGP 59 | 7.64 | 9.30 | 8.24 | 25.18 | 8.39 |
| CGP 154 | 7.37 | 8.85 | 8.52 | 24.74 | 8.24 |
| CGP 34 | 8.43 | 8.33 | 8.37 | 25.13 | 8.37 |
| CGP 110 | 7.61 | 8.84 | 9.04 | 25.49 | 8.49 |
| Chinese Pea | 6.58 | 7.58 | 9.34 | 23.50 | 7.83 |
| CGP 11 | 9.12 | 8.54 | 9.47 | 27.13 | 9.04 |
| Betag | 8.44 | 10.21 | 8.95 | 27.60 | 9.20 |
| Taichung | 8.87 | 8.00 | 7.96 | 24.83 | 8.27 |
| TOTAL | 87.24 | 97.51 | 95.91 | | |

ANALYSIS OF VARIANCE

| SOURCE OF VARIATION | DEGREES OF FREEDOM | SUM OF SQUARES | MEAN OF SQUARES | COMPUTED F | TABULATED F | |
|---|---|---|---|---|---|---|
| | | | | | 0.05 | 0.01 |
| Treatment | 10 | 10.36 | 1.036 | | | |
| Block | 2 | 5.55 | 2.776 | 4.00 | 2.35 | 3.37 |
| Error | 20 | 13.89 | 0.694 | | | |
| TOTAL | 32 | 29.80 | | | | |

ns – not significant CV (%) = 9.80%

Appendix Table 26. Pod width (cm)

| TREATMENT | BLOCK | | | TOTAL | MEAN |
|---|---|---|---|---|---|
| | I | II | III | | |
| CGP 116 | 1.49 | 1.49 | 1.67 | 4.65 | 1.55 |
| CLG | 1.47 | 1.52 | 1.36 | 4.35 | 1.45 |
| CGP 13 | 1.61 | 2.08 | 1.87 | 5.56 | 1.85 |
| CGP 59 | 1.53 | 1.70 | 1.49 | 4.72 | 1.57 |
| CGP 154 | 1.56 | 1.72 | 1.57 | 4.85 | 1.51 |
| CGP 34 | 1.63 | 1.50 | 1.78 | 4.91 | 1.63 |
| CGP 110 | 1.49 | 1.68 | 1.70 | 4.87 | 1.62 |
| Chinese Pea | 1.33 | 1.24 | 1.83 | 4.40 | 1.46 |
| CGP 11 | 1.52 | 1.58 | 1.69 | 4.79 | 1.59 |
| Betag | 1.74 | 1.80 | 1.65 | 5.19 | 1.73 |
| Taichung | 1.69 | 1.64 | 1.49 | 4.82 | 1.60 |
| TOTAL | 17.06 | 17.95 | 18.10 | | |

ANALYSIS OF VARIANCE

| SOURCE OF VARIATION | DEGREES OF FREEDOM | SUM OF SQUARES | MEAN OF SQUARES | COMPUTED F | TABULATED F | |
|---|---|---|---|---|---|---|
| | | | | | 0.05 | 0.01 |
| Treatment | 10 | 0.38 | 0.038 | | | |
| Block | 2 | 0.06 | 0.029 | 1.29 | 2.35 | 3.37 |
| Error | 20 | 0.45 | 0.022 | | | |
| TOTAL | 32 | 0.88 | | | | |

ns – not significant CV (%) = 9.27%

Appendix Table 27. Plant height at 35 days after planting

| TREATMENT | BLOCK | | | TOTAL | MEAN |
|---|---|---|---|---|---|
| | I | II | III | | |
| CGP 116 | 29.7 | 35.7 | 37.6 | 103 | 34.33 |
| CLG | 30.7 | 33.7 | 37.8 | 102.2 | 34.06 |
| CGP 13 | 34.7 | 42.5 | 43.2 | 120.4 | 40.13 |
| CGP 59 | 41.8 | 39.3 | 39.2 | 120.3 | 40.10 |
| CGP 154 | 40.2 | 40.6 | 39.8 | 120.6 | 40.20 |
| CGP 34 | 45.2 | 40.6 | 20.7 | 106.5 | 35.50 |
| CGP 110 | 42.5 | 29.6 | 33.6 | 105.7 | 35.32 |
| Chinese Pea | 29.0 | 32.4 | 34.1 | 95.5 | 31.83 |
| CGP 11 | 35.7 | 35.8 | 33.0 | 104.5 | 34.83 |
| Betag | 34.7 | 30.2 | 32.9 | 97.8 | 32.60 |
| Taichung | 27.7 | 19.6 | 25.3 | 72.6 | 24.20 |
| TOTAL | 386.7 | 302.86 | 377.10 | | |

ANALYSIS OF VARIANCE

| SOURCE OF VARIATION | DEGREES OF FREEDOM | SUM OF SQUARES | MEAN OF SQUARES | COMPUTED F | TABULATED F | |
|---|---|---|---|---|---|---|
| | | | | | 0.05 | 0.01 |
| Treatment | 10 | 1207.49 | 120.749 | | | |
| Block | 2 | 213.07 | 106.536 | 1.57 | 2.35 | 3.37 |
| Error | 20 | 1359.90 | 67.995 | | | |
| TOTAL | 32 | 2780.46 | | | | |

ns – not significant CV (%) = 6.18

Appendix Table 28. Plant height at flowering

| TREATMENT | BLOCK | | | TOTAL | MEAN |
|---|---|---|---|---|---|
| | I | II | III | | |
| CGP 116 | 43.9 | 60.0 | 63.7 | 167.7 | 55.90 |
| CLG | 60.8 | 59.7 | 56.7 | 177.2 | 59.06 |
| CGP 13 | 73.2 | 60.0 | 68.9 | 202.1 | 67.36 |
| CGP 59 | 71.4 | 55.4 | 60.1 | 186.9 | 62.30 |
| CGP 154 | 56.7 | 57.8 | 65.3 | 179.8 | 59.93 |
| CGP 34 | 72.2 | 65.3 | 44.0 | 181.5 | 60.50 |
| CGP 110 | 64.1 | 53.4 | 58.5 | 176.0 | 58.66 |
| Chinese Pea | 43.6 | 49.0 | 63.2 | 155.8 | 51.93 |
| CGP 11 | 52.9 | 59.2 | 57.0 | 162.8 | 56.36 |
| Betag | 59.2 | 58.1 | 55.4 | 172.7 | 57.56 |
| Taichung | 48.4 | 38.5 | 49.6 | 136.5 | 45.50 |
| TOTAL | 646.4 | 616.4 | 642.5 | | |

ANALYSIS OF VARIANCE

| SOURCE OF VARIATION | DEGREES OF FREEDOM | SUM OF SQUARES | MEAN OF SQUARES | COMPUTED F | TABULATED F | |
|---|---|---|---|---|---|---|
| | | | | | 0.05 | 0.01 |
| Treatment | 10 | 952.05 | 95.205 | | | |
| Block | 2 | 48.38 | 24.188 | 0.39 | 2.35 | 3.37 |
| Error | 20 | 1250.33 | 62.517 | | | |
| TOTAL | 32 | 2250.76 | | | | |

ns – not significant CV (%) = 13.69%

| TREATMENT | BLOCK | | | TOTAL | MEAN |
|---|---|---|---|---|---|
| | I | II | III | | |
| CGP 116 | 122.1 | 116.5 | 136.1 | 374.7 | 124.9 |
| CLG | 128.0 | 137.5 | 132.1 | 397.6 | 132.53 |
| CGP 13 | 132.5 | 122.7 | 134.7 | 389.9 | 129.96 |
| CGP 59 | 146.2 | 131.5 | 145.2 | 422.9 | 140.96 |
| CGP 154 | 137.4 | 120.2 | 126.6 | 384.2 | 128.06 |
| CGP 34 | 140.2 | 140.3 | 129.5 | 410.0 | 136.67 |
| CGP 110 | 122.5 | 127.5 | 140.6 | 390.6 | 130.20 |
| Chinese Pea | 151.9 | 145.5 | 134.0 | 431.4 | 143.80 |
| CGP 11 | 139.5 | 131.1 | 116.9 | 387.5 | 129.16 |
| Betag | 138.3 | 133.3 | 119.1 | 390.7 | 130.23 |
| Taichung | 149.3 | 139.4 | 137.5 | 426.2 | 142.06 |
| TOTAL | 1507.9 | 1445.4 | 1452.3 | | |

Appendix Table 29. Plant height at maturity

ANALYSIS OF VARIANCE

| SOURCE OF VARIATION | DEGREES OF FREEDOM | SUM OF SQUARES | MEAN OF SQUARES | COMPUTED F | TABULATED F | |
|---|---|---|---|---|---|---|
| | | | | | 0.05 | 0.01 |
| Treatment | 10 | 1207.49 | 120.749 | | | |
| Block | 2 | 213.07 | 106.536 | 1.57 | 2.35 | 3.37 |
| Error | 20 | 1359.90 | 67.995 | | | |
| TOTAL | 32 | 2780.46 | | | | |

ns – not significant CV (%) = 6.18%

Appendix Table 30. Weight of marketable fresh pod per plot (kg/5m$^2$)

| TREATMENT | BLOCK | | | TOTAL | MEAN |
|---|---|---|---|---|---|
| | I | II | III | | |
| CGP 116 | 0.76 | 1.36 | 1.54 | 3.66 | 1.22 |
| CLG | 1.04 | 1.02 | 1.26 | 3.32 | 1.11 |
| CGP 13 | 1.42 | 1.67 | 1.72 | 4.81 | 1.60 |
| CGP 59 | 1.58 | 0.68 | 1.39 | 3.65 | 1.21 |
| CGP 154 | 1.04 | 1.06 | 1.65 | 3.75 | 1.25 |
| CGP 34 | 2 | 1.48 | 1.39 | 4.87 | 1.62 |
| CGP 110 | 1.37 | 0.85 | 0.84 | 3.06 | 1.02 |
| Chinese Pea | 1.81 | 1.28 | 0.82 | 3.91 | 1.30 |
| CGP 11 | 1.21 | 1.06 | 1.23 | 3.50 | 1.16 |
| Betag | 1.47 | 0.65 | 0.92 | 3.04 | 1.01 |
| Taichung | 1.09 | 0.62 | 0.67 | 2.38 | 0.79 |
| TOTAL | 14.795 | 11.73 | 13.43 | | |

ANALYSIS OF VARIANCE

| SOURCE OF VARIATION | DEGREES OF FREEDOM | SUM OF SQUARES | MEAN OF SQUARES | COMPUTED F | TABULATED F | |
|---|---|---|---|---|---|---|
| | | | | | 0.05 | 0.01 |
| Treatment | 10 | 1.79 | 0.105 | | | |
| Block | 2 | 0.43 | 0.221 | 1.91 | 2.35 | 3.37 |
| Error | 20 | 2.07 | 0.115 | | | |
| TOTAL | 32 | 4.29 | | | | |

ns – not significant CV (%) = 26.57%

Appendix Table 31. Weight of non-marketable fresh pod per plot (kg/5m$^2$)

| TREATMENT | BLOCK | | | TOTAL | MEAN |
|---|---|---|---|---|---|
| | I | II | III | | |
| CGP 116 | 2.27 | 0.35 | 0.82 | 3.44 | 1.146 |
| CLG | 0.42 | 0.53 | 0.81 | 1.76 | 0.585 |
| CGP 13 | 0.55 | 0.35 | 0.85 | 1.75 | 0.583 |
| CGP 59 | 0.52 | 0.38 | 0.81 | 1.71 | 0.570 |
| CGP 154 | 0.61 | 0.44 | 0.71 | 1.76 | 0.586 |
| CGP 34 | 0.52 | 0.31 | 0.81 | 1.64 | 0.546 |
| CGP 110 | 0.54 | 0.49 | 0.55 | 1.58 | 0.526 |
| Chinese Pea | 0.80 | 0.61 | 0.26 | 1.67 | 0.556 |
| CGP 11 | 0.44 | 0.61 | 0.78 | 1.83 | 0.610 |
| Betag | 0.58 | 0.31 | 0.49 | 1.38 | 0.460 |
| Taichung | 0.33 | 0.45 | 0.59 | 1.37 | 0.456 |
| TOTAL | 7.575 | 4.83 | | | |

ANALYSIS OF VARIANCE

| SOURCE OF VARIATION | DEGREES OF FREEDOM | SUM OF SQUARES | MEAN OF SQUARES | COMPUTED F | TABULATED F | |
|---|---|---|---|---|---|---|
| | | | | | 0.05 | 0.01 |
| Treatment | 10 | 1.05 | 0.105 | | | |
| Block | 2 | 0.44 | 0.221 | 1.91 | 2.35 | 3.37 |
| Error | 20 | 2.31 | 0.115 | | | |
| TOTAL | 32 | 3.80 | | | | |

ns – not significant CV (%) =20.14%

Appendix Table 32.Total yield per plot (kg/5m$^2$)

| TREATMENT | BLOCK | | | TOTAL | MEAN |
|---|---|---|---|---|---|
| | I | II | III | | |
| CGP 116 | 3.03 | 1.71 | 2.36 | 7.10 | 2.36 |
| CLG | 1.46 | 1.55 | 2.07 | 5.08 | 1.69 |
| CGP 13 | 1.97 | 2.02 | 2.57 | 6.56 | 2.186 |
| CGP 59 | 2.10 | 1.06 | 2.20 | 5.36 | 1.786 |
| CGP 154 | 1.65 | 1.50 | 2.36 | 5.51 | 1.836 |
| CGP 34 | 2.52 | 1.79 | 2.20 | 6.51 | 2.170 |
| CGP 110 | 1.91 | 1.34 | 1.39 | 4.64 | 1.546 |
| Chinese Pea | 2.61 | 1.89 | 1.08 | 5.58 | 1.860 |
| CGP 11 | 1.65 | 1.67 | 2.01 | 5.33 | 1.776 |
| Betag | 2.05 | 0.96 | 1.41 | 4.42 | 1.473 |
| Taichung | 1.45 | 1.07 | 1.26 | 3.75 | 1.250 |
| TOTAL | 22.37 | 16.56 | 20.91 | | |

ANALYSIS OF VARIANCE

| SOURCE OF VARIATION | DEGREES OF FREEDOM | SUM OF SQUARES | MEAN OF SQUARES | COMPUTED F | TABULATED F | |
|---|---|---|---|---|---|---|
| | | | | | 0.05 | 0.01 |
| Treatment | 10 | 3.29 | 0.329 | | | |
| Block | 2 | 1.66 | 0.830 | 5.11* | 2.35 | 3.37 |
| Error | 20 | 3.25 | 0.163 | | | |
| TOTAL | 32 | 8.20 | | | | |

* –significant CV (%) =22.23%