BIBLIOGRAPHY

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ABSTRACT

The experiment on adaptability and acceptability of soybean was conducted at Pacso, Kabayan, benguet.

Among the soybean accessions from AVRDC, AGS 439 and AGS 433 are the best in terms of earliness to flower and to first green pod formation. The accession also produced the tallest plants, widest, longest, heaviest and most acceptable pods.

Though the local variety was the earliest to emerge, produced the heaviest marketable pods and tallest plants, it was disliked moderately.

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INTRODUCTION

Soybean, scientifically known as *Glycine max*, is an erect, bushy annual that varies in height from 12 inches to 8 feet depending upon the cultivar, daylength, temperature, moisture and nutrition requirement. The first true leaves are simple and opposite, while all later occurring leaves are trifoliate and alternate (Smith,1995).

Soybean is an important global crop, providing oil and protein. The bulk of the crop is solvent-extracted for vegetable oil and then defatted soy meal is used for animal feed. A small proportion of the crop is consumed directly by humans. Soybean products appear in large varieties of processed food (Wilson and Clifford, 1975).

Soybean can be grown in the tropics and subtropics throughout the year, but a number of factors limit production, i.e. the physical and chemical characteristics of the soil and water environment and the overlapping effects of climate (Sulzberger and Mclean, 1986)

Vegetable soybean is a rich and a cheap source of vitamins, minerals, protein, energy and fiber. It is a very versatile crop that fits well into cropping systems, has oil-enriching properties and high income value for small farmers. However, in spite of these advantages the crop is still relatively unknown to most farmers in the country (AVRDC, 1994).

Aside from the benefit it can give to man and animals, it is also important for the soil. As a leguminous crop, the plant takes nitrogen from the air and add it to the soil through the action of the bacteria in its roots.

At present, farmers at Kabayan are planting cruciferous crops like cabbage, broccoli, cauliflower, root crops (sweet potato and carrots) and snap bean only for legumes. Also most of the farmers are practicing monocropping. Because of this practices, it is advisable to introduce and encourage other crops such as green soybeans. The selection of the best varieties that could perform well and accepted by farmers should be considered in introducing a crop in the locality. Furthermore, because of the effect of the climate change on agriculture particularly on crop adaptation, there is need to evaluate potential crops in the locality as alternate crops.

In this case, the study was evaluating accessions of soybean. Soybean just like snapbean is an excellent source of proteins and vitamins, partly contributing to the solution of the malnutrition problem.

Objectives of the Study

The study was conducted to:

1. determine the adaptability of the different soybean accessions in Pacso, Kabayan, Benguet condition

2. determine the best soybean accession/s based on the yield and resistance to pests and diseases and;

3. determine the acceptability of the accession.

Time and Place of the Study

The study was conducted at Pacso, Kabayan, Benguet from October 2008 to February 2009.

REVIEW OF LITERATURE

Botanical Description of Soybean

Soybean belongs to the Fabaceae or Leguminosae family. The soybean is known as *Soya* in French, *SoJa* in Spanish and Italian and *sojabohne* in German (Benton, 2003). However, it is considered a pulse crop with low to high oil content and greater response to applied nitrogen levels, it has now been place in oil seeds category (Singh, 1991).

Soybean plants which have typical, small legume flowers are predominately self-pollinated. However, cross pollination by insects does occur and may be a problem in maintaining cultivar purity in the seed fields. Flower is purple or white; eight to sixteen flowers are borne in terminal or auxiliary racemes. Typical of the legume family, the pistil is simple and the ovary matures into legumes pod. At maturity pod usually contains of two to three seeds but can produce as many as five seeds per pods. Seeds vary in shape from nearly spherical to somewhat flattened discs and the color from pale green yellow to dark brown (Chapman, 1976).

Soybean is looked upon not merely as a means to supply food for humans and animals, but also at the same time to serve as a means for improving the soil through their ability to fix atmospheric nitrogen. As a legume, it is an ideal component of a sound agricultural system. It is in the perspective of all these advantages of adaptability and productivity across tropical, subtropical and temperature environments that significant strides have been made in its innovation. In fact, the expansion of soybean across the world has been characterized as one of the striking development of recent decades.

Climate and Soil Requirements

Soybean thrives well in area where there is less rainfall during the wet season, and only a short dry season. The temperature requirement is 10-40^{0}C. The crop is grown from latitudes of 0 to 55 degrees however; management practices, cultivar selection and the concentration of commercial production vary considerably across those latitudes (Persley, 1983).

Smith (1995) reported that air and temperature affect soybean growth and development physiology processes, nitrogen fixation, seed quality, protein and oil content, and pest damage. The optimum air temperature for seed germination and hypocotyl elongation is about 30^{0}C. Optimum temperature for photosynthesis is between 25 and 30^{0}C. For nodule formation and the development of nitrogen fixation, 27^{0}C appears to be optimum. Nutrient uptake is also favored by temperature between 25 to 30^{0}c. The minimum for germination is 5^{0}C while the maximum temperature is 40^{0}C. Growth activity increases with temperatures from about 10^{0}C to the optimum and then tend to decline as temperature's exceeds the optimum. Furthermore, all stages of soybean development are photoperiod responsive to some degree. Seasonal variation and day length become more important for the adaptation and eventual production of soybean cultivars at increasingly higher latitudes. Therefore, in temperate zone the planting date becomes critical in the selection of cultivars for high grain yields. Day length variation during the growing season is close to three hours, enough to alter the growth and development of soybean cultivar.

Soybean can be grown in deep, well-drained, fertile clay loam or sandy loam soil with high calcium content. Soil pH of 5.8-6.5 is suitable with high calcium content. Soil pH of

5.8-6.5 is suitable for the growth of both soybean and the nitrogen-fixing bacteria (Norman 1978).

In general, the crop is sensitive to saline soils but there are cultivar differences. Cultivar selection may be extremely important for successful production in salty soils. The water holding capacity and the nutrient content of various soils will usually determine the degree of success. The optimum soil pH for soybean is near or slightly below neutral. Extremely acid or alkaline soils may reduce the availability of certain nutrient and cause stress (Smith, 1995).

Cultural Management

Van der Maesen et al (1990) reported that basal and side dressing of fertilizer maybe used based on the result of soil analysis. However, in the absence of such analysis and during the dry season cropping, basal application of three bags of ammonium phosphate and one bag of muriate of potash (24 kg N, 30 kg P_2O_5 and 30 kg of K_2O) per hectare is recommended for soybean planted after corn and upland rice. If these fertilizers are not available, four bags of complete fertilizer per hectare may be used.

Smith (1995) reported that nitrogen fertilization is less important with the crop than with non-legume crops than can be grown in similar environments because the crops co-symbiotically fix nitrogen when in association with *Rhizobium japonicum*. Producing a soybean crop may be needed depending on the soil analysis. Micronutrient toxicity has also reduced the productivity of soybeans in certain soils.

Soybean is responsive to irrigation especially at its reproductive phase. Water consumption is relatively low after germination and greatest at the beginning of blooming. Unless exposed to continuous long drought, soybean is not much affected. The soybean water requirement ranges from 0.5-0.8 cm/day during seed filling. During the entire growing period, it needs 550-700 mm. For dry areas, the recommended application rate is 40-60 cm per cropping season in three applications: The first application is done soon after planting while he other two irrigations are applied during the periods of blooming and pod setting (Benton, 2003).

In addition, proper soil moisture is for good and uniform germination. Heavy rain and flooding soon after planting before germination will result in seed rot and poor plant stand. Irrigation is essential especially (if there insufficient moisture) at flowering and pod-filling stages. Soil cracking and plant wilting should be as much as possible avoided. Irrigation is necessary after fertilizing (Shanmugasundaram, 1991)

Furthermore, Shanmugasundaram (1991) reported that inoculated seeds should be coated thoroughly with fresh *Rhizobium japonicum* and from a reputable source or apply granular inoculums in plant rows at the time of sowing. This inoculation will promote nodule formulation and fixation by the plant roots. It is not required to apply inoculation in field where legumes are regularly cultivated.

On the other hand, soybean seeds are physiologically mature when maximum dry weight and seed viability are attained. Soon after maturity, the seed crop is ready for harvest when pods turned browned and leaves have yellowed and fallen-off. At harvest time, seed moisture is very high (20-26%). This factor exerts the greater influence on seed quality. It is important that the post-harvest seed moisture is reduced as quickly as possible and maintenance to preserve high seed quality (Whigham, 1983).

For vegetable soybeans Shanmugasundaram (1991) reported that, it is ready for harvest when the pods are still green and 80% of all pods are completely filled with seed.

Varietal Evaluation and Adaptability

Varietal evaluation is important to observe the performance characters such as yield, earliness, vigor, maturity and quality because varieties has a wide range difference of a plant in size and yield performance (Work and Carew, 1995).

Varietal evaluation gathers data on plants characteristics, yield performance and pod quality. Hence, we can obtain high yield and improve varieties that are known to plants important role in boosting production (Regmi, 1990). Moreover, Bautista and Mabesa (1977) stated that the variety to be selected should be high yielding, pests and disease resistant and early maturing so that production would entail less expense, and ensure more profit. Selecting the right variety will minimize problems associated with water and fertilizer managements.

Furthermore, varietal evaluation is a process in plant breeding, which provides comparison of promising lines by breeders. It is through varietal evaluation that a variety among developed lines in terms of yield, quality adaptability stress, tolerance and resistance to pest and disease is selected (Sunil, 1990).

Thus, varietal improvement is a major activity which is expected to increase cropping intensity and yield. Since soybean is grown mostly as an upland, non-irrigated crop, it has to withstand drought as well as water-logging to fit to the prevailing rainfall patterns in different regions. The development of early-maturing and photoperiod-insensitive cultivars which are resistant to pest and disease and disease is desirable (Shanmugasundaram, 1991).

Reilly and Shry (1991) reported that variety must be adapted to the area in which it is grown. Different varieties which are grown under the same method of culture have a great variation in the yielding ability. A variety that yields in one region is not a guarantee that it will perform well in another region.

Genetic Resources of Soybean

Germplasm is a collection of genetic resources for an organism. For plants, the germplasm may be stored as a seed collection or genetic diversity (Peregine, 2003). Genetic diversity is the basic raw material upon which genetic improvement of soybean varieties is dependent. The soybean germplasm collection is the primary source of soybean genetic diversity available to US researchers to address these problems and identifying new and useful diversity is critical to the economic health of the soybean industry (USDA, 2006).

Germplasm of soybean are collected in order to save the traditional material cultivated in several localities. Germplasm collection is done to conserve, multiply and make the seed of soybean and utilization purposes Shanmugasundaram (1991). Brush (1995) conducted that gene bank is the storage center of genetic resources because it ensures conservation of genetic diversity that will provide germplasm for small breeders and farmers.

Shanmugasundaram (1987) Stated that AVDRC has screened the majority of the germplasm and has identified resistant or tolerant accessions to soybean rust, beanfly and insensitivite to photoperiod. Furthermore, vertical resistant gene available in the soybean germplasm is being incorporated into improved breeding lines.

MATERIALS AND METHODS

An area of 165 m^2 was properly cleaned and prepared into raise beds. The area was divided into three blocks consisting of 11 plots measuring 1m x 5 m. The seeds was sown in two rows with a distance of 40 cm between rows and 30 cm between hills at a depth of 4-5 cm at 1 seed per hill. The experiment was laid out using the randomized complete block design (RCBD) with three replications. The accessions were acquired from Asian vegetable research development center (AVRDC), Taiwan. A local check from Ifugao was included in the trial

ACCESSION	DESCRIPTIONS
A_1	AGS 432
A_2	AGS 433
A_3	AGS 434
A_4	AGS 435
A_5	AGS 436
A_6	AGS 437
A_7	AGS 438
A_8	AGS 439
A_9	AGS 440
A_{10}	AGS 292
A_{11}	Local Variety

Cultural management practices such as irrigation, weeding, fertilizer application, side dressing and hilling- up, and disease control were properly employed.

Data Gathered

1. Agro-climatic data. Temperature, relative humidity, light intensity and rainfall were taken during the conduct of experiment.

2. Maturity

a. Days of sowing to emergence. This was recorded by noting the date of sowing minus the date of emergence.

b. Days from emergence to flowering. This was recorded by noting the date of sowing minus the date of flowering.

c. Days from flowering to pod setting. This was recorded by counting the number of days starting from flowering to the days when pod set are formed at the same time recording the date of pod setting.

d. Days from emergence to first harvest. This was recorded by counting the number of days from emergence to first harvest at the same time recording the date of first harvest.

e. Days from emergence to last harvest. This was recorded by counting the number of days from emergence to last harvest at the same time recording the date of last harvest.

3. Plant Height

a. Initial plant height (cm). This was measured from the base of the plant at ground level to the tip of the youngest shoots, using a meter stick from five samples per plot at 30 days after planting.

b. Final height (cm). This was measured from the base of the plant at the ground level to the youngest shoots before the first harvest, using a meter stick from five samples per pot.

4. Plant Characters

a. Growth Habit. This was recorded by observing the growth of the plants either as determinate or indeterminate.

b. Plant Vigor: This was gathered at 30 and 60 DAP using the CIP rating scale (as cited by NPRCRTC, 1983).

Scale	Description	Remarks
1	Plants are weak with few stems and leaves; very pale.	poor vigor
2	Plants are weak with few thin Stems and leaves; pale	less vigorous
3	Better than less vigorous	Vigorous
4	Plants are moderately strong with robust stem and leaves; leaves are light green in color.	moderately vigorous
5	Plants are strong with robust stems and leaves; leaves are light to dark green in color.	highly vigorous

c. Reaction to Lodging. This was taken by rating the plants before harvest.

Scale	Description	Remarks
1	All plants erect	Resistant
2	All plants leaning slightly or 10% of the plants lodging	moderately resistant
3	10 to 50% of the plants lodging	Intermediate
4	50 to 80% of the plants lodging	moderately lodging
5	almost all the plants lodging	Susceptible

5. Pod Characters

a. Number of one-seeded , two-seeded and three-seeded pods. This was recorded by stripping the pods from these five plants and separate the one-seeded, two seeded and three-seeded pods into three groups then counted separately.

b. Weight of one-seeded, two-seeded and three-seeded pods. This was recorded after counting the pods separately then weighed.

c. Length of one-seeded pods, two-seeded pods and three-seeded pods. This was recorded by measuring the selected five one-seeded pods, two-seeded and three-seeded randomly and the length measured.

d. Width of one-seeded pods, two-seeded pods and three-seeded pods. This was recorded after measuring the length of five full one-seeded, two-seeded and three-seeded pods then the width measured.

e. Pods Color. Rate pod color was described using the following scale:

Scale	Description
1	Dark green
2	Green
3	Yellow-Green
4	Yellow

6. Yield and Yield Components

a. Weight of marketable fresh pod per plot (kg). This was recorded by weighing the marketable fresh pods per plot. Marketable pods are smooth, well-formed and free from damages.

b. Weight of non-marketable fresh pods per plot (kg). This was obtained by weighing the non-marketable pods per plot. These are pods that over matured, malformed and damaged by pest and diseases.

c. Total yield per plot (kg). This was recorded by summing the total weight of marketable pods and non-marketable pods per plot.

d. Computed fresh pod yield per hectare (t). This was computed based on the total yield per plot using the formula:

$$\text{Yield (t/ha)} = \frac{\text{Total yield per plot}}{5m^2} \times 2$$

Where 2 is the factor used to convert yield in $kg/5m^2$ to ton/ha. Assuming one hectare effective area.

7. Reaction to Pest and disease. This was assessed by rating the degree of disease and insect damage on the crop. Reaction were rated using the following scale:

a. Soybean Rust

Scale	Description	Remark
1	No infection	High resistant
2	1-20% of the total plant per plot is affected	Mild resistant
3	25-50% of the total plant per plot is affected	Moderate resistant
4	51-75% of total plant per plot is affected	Susceptible
5	76-100% of the total plant per plot is affected	Very susceptible

b. Rating scale for leaf miner damage

Scale	Description	Remark
1	No infection	High resistant
2	1-20% of the total plant per plot is affected	Mild resistant
3	25-50% of the total plant per plot is affected	Moderate resistant
4	51-75% of total plant per plot is affected	Susceptible
5	76-100% of the total plant per plot is affected	Very susceptible

8. Sensory Evaluation for Green Shelled. Newly harvested pods were blanched separately and were evaluated by 15 panelists for general acceptability and aroma using the following scale.

a. Acceptability

Scale	Description
1	dislike very much
2	dislike moderately
3	like
4	like moderately
5	like very much

b. Aroma

Scale	Description
1	Not aromatic
2	Slightly aromatic

3	Moderately aromatic
4	Very aromatic
5	Extremely aromatic

Analysis of Data

All quantitative data were analyzed using the analysis of variance (ANOVA) for randomized complete block design (RCBD). The significance of difference among treatment means was tested using the Duncan's Multiple Range Test (DMRT) at 5% level of probability.

Figure 2. Overview of the experimental area before planting and after hill-up

RESULTS AND DISCUSSION

Meteorological Data During the Conduct of the Study

Table 1 shows the temperature, relative humidity, amount of rainfall and light intensity during the conduct of the study. The temperature ranges from 16.30 to 23.89 ^{0}C. Highest temperature of 23.89^{0}C was experienced in of October while the lowest temperature was observed in January (16.30 ^{0}C). The relative humidity was highest in the February (80%), while lowest was in October of 51%. Rainfall occurred only in the November of 75.57 ml. Light intensity was gathered during pod setting of the plants.

Temperature during the conduct of the study was favorable for soybean production since soybeans grow best at temperatures between 10 to 40^{0}C.

Table 1. Meteorology data during the conduct of the study

Month	TEMPERATURE (0C)	RELATIVE HUMIDITY	RAINFALL (ml)
October	23.89	51	-
November	23.43	57	75.57
December	17.22	69	-
January	16.30	71	-
February	19.13	80	-
MEAN	20.13	65.6	75.57

Number of Days from Sowing to Harvesting,

Significant differences were observed among the accessions on the number of days from sowing to flowering. The local soybean accession was the earliest to emerge at seven days after sowing but the latest to be harvested (73 days). The other accessions emerged eight days after sowing and were the first to be harvested at 72 days after emergence. Apparently, all the eleven accessions of soybeans have similar maturity period under Pacso, Kabayan, Benguet (Table 2).

Table 2. Number of days from sowing to harvesting of the 11 soybean accessions

	NUMBER OF DAYS FROM				
	SOWING TO	EMERGENCE TO	FLOWERING TO	EMERGENCE TO	
ACCESSIONS	EMERGENCE	FLOWERING	POD SETTING	FIRST HARVEST	LAST HARVEST
AGS 432	8[b]	39[fg]	6	72[a]	85
AGS 433	8[b]	40[g]	6	72[a]	85
AGS 434	8[b]	38[fg]	5	72[a]	85
AGS 435	8[b]	40[g]	6	72[a]	85
AGS 436	8[b]	34[a]	7	72[a]	85
AGS 437	8[b]	36[ed]	5	72[a]	85
AGS 438	8[b]	34[a]	6	72[a]	85
AGS 439	8[b]	34[a]	6	72[a]	85
AGS 440	8[b]	37[de]	6	72[a]	85
AGS 292	8[b]	35[bc]	5	72[a]	85
Local variety	7[a]	47[g]	6	73[b]	85
CV (%)	5.11	2.16	9.56	0.64	0.56

*Means followed by a common letters are not significantly different at 5% level by DMRT

No significant differences were observed among the eleven soybean accessions on the number of days from flowering to pod setting and last harvest. Differences on the days to harvesting could be attributed to the varietal characteristics of the different accessions in terms of maturity.

Initial and Final Plant Heights

Plant height at 30 days after planting and before the first harvest was observed to be significantly different among the accessions. AGS 292 produced the tallest plants (14.79cm) while the local variety the shortest of 11.51 cm but had the tallest final height of 23.21 cm.

Table 3. Initial and final height of the 11 soybean accessions

ACCESSIONS	PLANT HEIGHT (cm)	
	INITIAL	FINAL
AGS 432	12.41^{f}	15.75^{de}
AGS 433	14.30^{ab}	22.79^{a}
AGS 434	12.58^{ef}	18.03^{c}
AGS 435	14.09^{b}	21.60^{ab}
AGS 436	13.09^{de}	20.45^{b}
AGS 437	13.45^{ed}	18.43^{c}
AGS 438	13.71^{bc}	18.58^{c}
AGS 439	12.10^{f}	14.39^{e}
AGS 440	13.49^{cd}	17.47^{cd}
AGS 292	14.79^{a}	18.47^{c}
Local Variety	11.51^{g}	23.21^{a}
CV (%)	5.40	5.85

*Means followed by a common letters are not significantly different at 5% level by DMRT

AGS 433 had a comparable initial height with AGS 292 and final height with the local variety. Differences in the height of the plants could be due to the inherent characteristics of the accessions like narrow adaptability to climatic condition of the introduced accessions while the local variety is already adapted (Table 3).

Table 4. Plant vigor at 30 and 60 days after planting of the 11 soybean accessions

ACCESSIONS	PLANT VIGOR (DAP)	
	30	60
AGS 432	1[b]	2
AGS 433	2[a]	3
AGS 434	2[a]	3
AGS 435	2[a]	3
AGS 436	2[a]	3
AGS 437	2[a]	3
AGS 438	2[a]	3
AGS 439	2[a]	3
AGS 440	2[a]	3
AGS 292	2[a]	3
Local variety	2[a]	4
CV (%)	11.56	

*Means followed by a common letters are not significantly different at 5% level by DMRT

Legend: 1- Poor vigor; 2- Less vigorous; 3- vigorous; 4-moderately vigorous; 5- Highly Vigorous

Plant Vigor at 30 and 60 Days after Planting

AGS 432 significantly exhibited poor vigor while the AVRDC accessions were all less vigorous at 30 days after planting. At 60 days after planting, most of the accessions were observed to be vigorous. The local variety was moderately vigorous while AGS 432 was less vigorous (Table 4).

The poor plant vigor could be due to the lack of water during the vegetative stage of the plant and the prevailing climatic condition during the growing period of the plant.

Growth Habit, Pod Color and Reaction to Lodging

The growth habits of the eleven soybean accessions are determinate. Determinate soybeans have fewer nodes per plant and are shorter at maturity than indeterminate type (Baligar and Jones, 1997).

For the pod color, nine soybean accessions have green fresh pods, AGS 440 has dark green while the local variety has yellow green. On the reaction to lodging, all the 11 soybean accessions were observed to be resistant.

Number, Width, Length and Weight of
One- , Two- and Three-seeded Pods

Significant differences were observed in all the parameters gathered as shown in Table 5.

Number of Seeds per Pod

Significant differences among the accessions were recorded in one-seeded pods. The local variety produced significantly the highest number of one-seeded, two-seeded and three-seeded pods. Lowest number of one-seeded pod was observed in AGS 432 (31), AGS 436

(45) and AGS 440 (46). AGS 432 had the least number of two-seeded pods of 31 and AGS 434 recorded the least (2) of three-seeded pods.

Basically, the number of seeds per pod is controlled by its genetic components and therefore not easily influenced by the environmental factor (Buena, 2004). Furthermore, there are also other factors that affect the development of the seed per pods such as; pest, disease, nutrient and water availability.

Width of Pods

For the width of one-seeded pods, AGS 439 had the widest pods with of 1.85 cm comparable with accession AGS 433 (1.75cm); AGS 434 (1.78cm); AGS 435 (1.74cm) and AGS 440 (1.75cm). The narrowest pods were obtained from the local variety (1.39 cm).

For the two-seeded pods, AGS 440 had the widest pods of 1.84 cm while the local variety had the narrowest pods of 1.37 cm. On the width of the three-seeded pods, AGS 440 had the widest pod width with a mean of 1.77 cm. However, it was observed that all the varieties tested had acceptable pod width based on the desirable width of legumes as cited by Tandang (1990).

Length of Pods

Significant differences were observed among the accessions in terms of pod length. The longest one-seeded pods were obtained from AGS 439 (4.17cm) followed by AGS 438 (4.13cm) and AGS 433 (4.05 cm) while AGS 432 has the shortest pods length of 3.39cm.

As to two-seeded pods, AGS 439 produced the longest pods of 5.61 cm comparable with AGS 440 and AGS 438. The shortest pods were obtained from AGS 432. For the three-seeded pods, AGS 438 has the longest pods of 6.37 cm.

Pod length is one of the criteria used to determine the marketability of the legume pods. Consumers and buyers of the beans pods usually prefer longer pods than the shorter ones (Viernes, 2000). In this study, pod length was measured from the pedicel to the blossom end of the pods.

Weight of Pods

The local variety registered the heaviest pods of 0.79 kg one-seeded pods. AGS 433 had a comparable weight (0.75kg) while the lightest was obtained from AGS 432 (0.22kg).

Significant differences were observed among the accessions in terms of the weight of two-seeded pods. The local soybean variety produced heaviest pods of 1.78 kg followed by AGS 439 (1.35kg) while the lightest was obtained from AGS 432 with 0.35 kg.

On the weight of the three-seeded pods, AGS 438 produced the heaviest pods of 0.29 kg comparable with AGS 433 (0.21kg), AGS (0.20kg) and AGS 439 (0.22kg).

Table 5. Number, width, length and weight of one-seeded, two-seeded and three-seeded pods of the 11 soybean accessions

ACCESSION	ONE-SEEDED POD				TWO-SEEDED POD				THREE-SEEDED POD			
	NUMBER	WIDTH (cm)	LENGTH (cm)	WEIGHT (kg)	NUMBER	WIDTH (cm)	LENGTH (cm)	WEIGHT (kg)	NUMBER	WIDTH (cm)	LENGTH (cm)	WEIGTH (kg)
AGS 432	31^{c}	1.56^{c}	3.39^{c}	0.22^{c}	31^{d}	1.48^{f}	4.43^{e}	0.35^{e}	4^{cde}	0.54^{bc}	1.57^{b}	0.09^{def}
AGS 433	94^{b}	1.78^{ab}	4.05^{a}	0.^{75c}	61^{c}	1.65^{bcd}	4.93^{bc}	0.88^{c}	12^{bc}	1.54^{a}	5.59^{a}	0.21^{bc}
AGS 434	50^{bc}	1.78^{ab}	3.84^{ab}	0.42^{bc}	40^{cd}	1.72^{bc}	5.12^{b}	0.50^{de}	2^{e}	1.52^{a}	4.79^{a}	0.04^{f}
AGS 435	64^{bc}	1.74^{ab}	3.77^{abc}	0.44^{bc}	48^{cd}	1.59^{def}	4.82^{cd}	0.56^{de}	3de	1.55^{a}	4.67^{a}	0.07^{ef}
AGS 436	45^{c}	1.71^{abc}	3.91^{ab}	0.42^{bc}	41^{cd}	1.73^{b}	5.19^{b}	0.64^{cd}	11^{cd}	1.66^{a}	5.90^{a}	0.20^{bc}
AGS 437	52^{b}	1.62^{bc}	3.57^{bc}	0.48^{bc}	33^{d}	1.52^{ef}	4.51^{e}	0.52^{de}	4^{cde}	0.57^{bc}	1.78^{a}	0.05$_{f}$
AGS 438	52^{bc}	1.65^{bc}	4.13^{a}	0.40^{bc}	60^{c}	1.61^{cde}	5.48^{a}	0.92^{c}	19^{b}	1.61^{a}	6.37^{a}	0.29^{b}
AGS 439	70^{bc}	1.85^{a}	4.17^{a}	0.57^{ab}	83^{b}	1.71^{bc}	5.61^{a}	1.35^{b}	10^{cde}	1.70^{a}	6.29^{a}	0.22^{bc}
AGS 440	46^{c}	1.75^{ab}	3.81^{abc}	0.45^{bc}	43^{cd}	1.84^{a}	5.50^{a}	0.73^{cd}	10^{cde}	1.77^{a}	6.50^{a}	0.17^{cd}
AGS 292	73^{bc}	1.65^{bc}	3.58^{bc}	0.65^{ab}	48^{cd}	1.62^{bcde}	5.01^{bc}	0.67^{cd}	5^{cde}	1.08^{ab}	1.83^{b}	0.15^{cde}
Local Variety	165^{a}	1.39^{d}	3.56^{bc}	0.79^{a}	210^{a}	1.37^{g}	4.59^{dc}	1.78^{a}	35^{a}	1.52^{a}	4.97^{a}	0.39^{a}
CV (%)	26.02	27.29	5.12	5.99	17.97	18.98	4.10	3.27	17.32	29.25	17.80	15.63

*Means followed by a common letter are not significantly different at 5% level by DMRT.

Weight of Marketable and Non- marketable Pods per $5m^2$ Plot

Table 6 shows significant differences on the weight of marketable fresh pods of the 11 soybean accessions. The local variety produced the highest marketable fresh pod yield of 2.56 kg and a total fresh pod yield of 2.26 kg. Among the AVRDC accession AGS 439 produced the heaviest marketable pods of 1.95 kg comparable with AGS 433 that produced 3.69 kg. AGS 434 had the lowest marketable and total fresh pod yield of 0.45 kg and 0.66 kg, respectively.

The fresh pods of vegetable legumes are considered marketable when they are smooth, tender and free from pest and insect damage (Gonzales, 1983).

Computed Fresh Pods Yield per Hectare

Among the accessions the local variety had significantly the highest computed fresh pod yield of 5.92 ton. The lowest computed fresh pod yield per hectare was obtained from AGS 432 with 1.34 tons. This finding may be attributed to the genetic characteristic of the different accessions.

Regmi (1990) stated that there are always variations a yield and yield components among the varieties. This could be due to the varying potential and with the interaction with the environmental condition. Generally, soybeans are temperate and photoperiod sensitive with temperature between 10 to 40^0C and are short-day plants (Baligar and Jones, 1997).

Table 6. Marketable, non-marketable and total fresh pod yield of the 11 soybean accessions

ACCESSION	YIELD (kg/5m^2) MARKETABLE	NON-MARKETABLE	TOTAL	COMPUTED FRESH POD YIELD PER HECTARE (t/ha)
AGS 432	0.45^{f}	0.21	0.66^{g}	1.34^{g}
AGS 433	1.56^{bc}	0.29	1.85^{bc}	3.69^{bc}
AGS 434	0.82^{ef}	0.13	0.95^{fg}	1.58^{fg}
AGS 435	0.89^{e}	0.18	1.08^{efg}	2.16^{efg}
AGS 436	1.05^{de}	0.22	1.26^{def}	2.50^{def}
AGS 437	0.96^{e}	0.08	1.05^{efg}	2.09^{efg}
AGS 438	1.48^{cd}	0.14	1.62^{cd}	3.30^{cd}
AGS 439	1.95^{b}	0.19	2.14^{b}	4.28^{b}
AGS 440	1.07^{de}	0.28	1.35^{def}	2.69^{cde}
AGS 292	1.21^{cde}	0.26	1.47^{cde}	2.95^{cde}
Local variety	2.56^{a}	0.40	2.96^{a}	5.92^{a}
CV (%)	18.87	0.40	18.49	18.66

*Means followed by a common letter are not significantly different at 5% level by DMRT.

Reaction to Soybean Rust and Leaf Miner

The AVRDC soybean accessions and the local variety showed mild to moderate resistance to soybean rust and leaf miner incidence as shown in Table 7.

The resistance of the accessions could be due to the inherent characteristic and the prevailing climatic condition during the study which was unfavorable for the occurrence of bean rust and leaf miner.

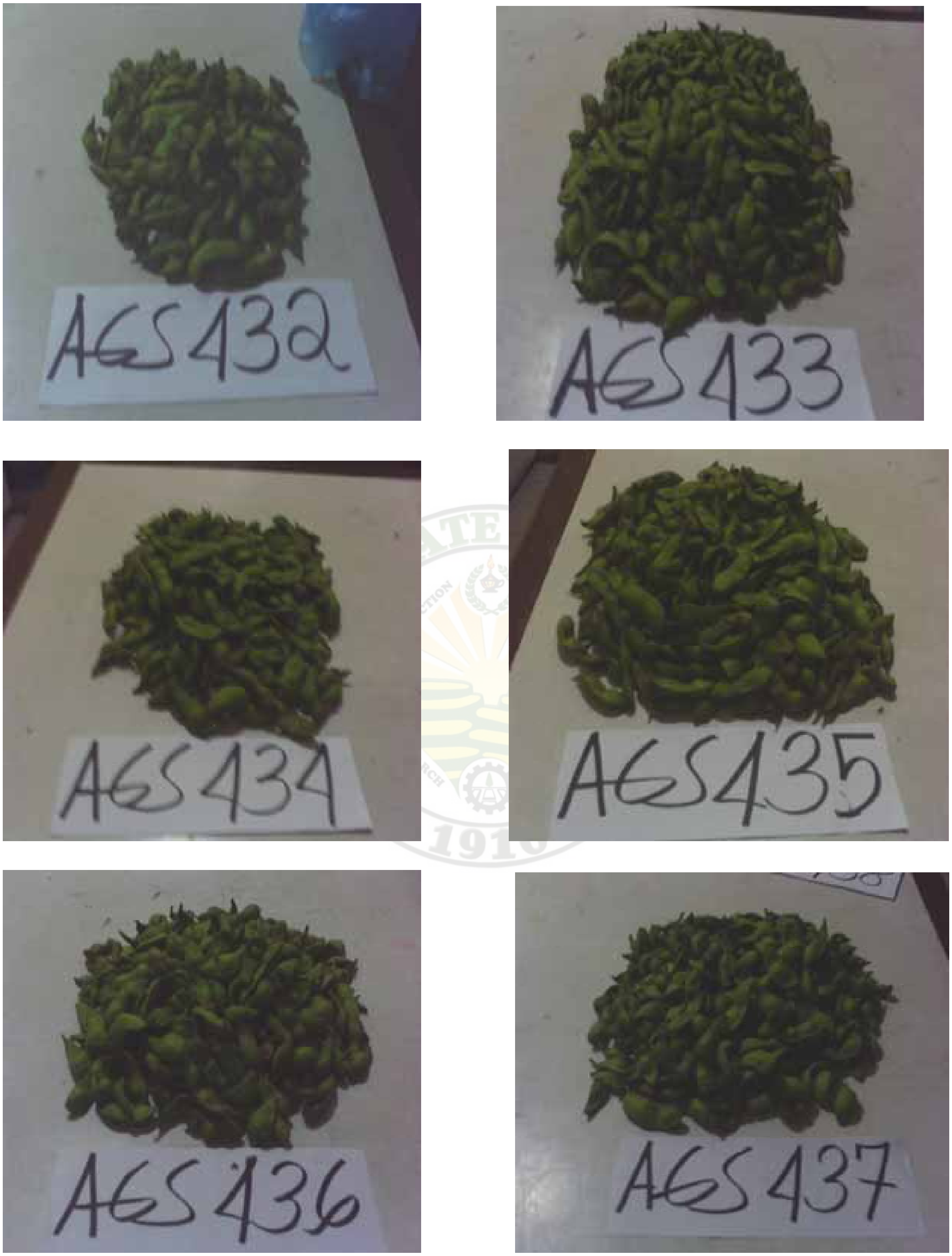

Figure 2a. Marketable pods yield of the six soybean accessions

Figure 2b. Marketable pods yield of the five soybean accessions

Table 7. Reaction to soybean rust and leaf miner of the 11 soybean accessions

	REACTION TO:	
ACCESSIONS	SOYBEAN RUST	LEAF MINER
AGS 432	2[b]	2
AGS 433	3[a]	2
AGS 434	2[b]	2
AGS 435	2[b]	3
AGS 436	3[a]	3
AGS 437	2[b]	2
AGS 438	3[a]	3
AGS 439	3[a]	2
AGS 440	2[b]	2
AGS 292	2[b]	2
Local Variety	2[b]	2
CV (%)	16.42	17.07

*Means followed by a common letter are not significantly different at 5% level by DMRT.

Legend: 1- High resistant; 2- mild resistant; 3- moderately resistant; 4- susceptible; 5- Very susceptible

Sensory Evaluation of Boiled Green Pods

Harvested pods were blanched and evaluated by 15 panelists who served as evaluators. The pods were assessed based on the aroma and general acceptability.

AGS 434 and AGS 435 were rated moderately aromatic while the other accessions were judged as slightly aromatic. On the general acceptability there were significant differences among accessions (Table 8). Most of the accessions were liked except for

AGS 440 which was rated liked moderately while the local soybean accession was rated dislike moderately.

In terms of the sensory evaluation of fresh pods, consumers were considered the color of the fresh pods. The green to dark green fresh pods were more acceptable than yellow pods.

Table 8. Aroma and general acceptability of 11 soybean accessions

ACCESSIONS	RATING: AROMA	GENERAL ACCEPTABILITY
AGS 432	2	3[b]
AGS 433	2	3[b]
AGS 434	3	3[b]
AGS 435	3	3[b]
AGS 436	2	3[b]
AGS 437	2	3[b]
AGS 438	2	3[b]
AGS 439	2	3[b]
AGS 440	2	4[a]
AGS 292	2	3[b]
Local variety	2	2[c]
CV (%)	13.41	29.89

*Means followed by a common letter are not significantly different at 5% level by DMRT.
Aroma: 1- Not aromatic; 2- slightly aromatic; 3- moderately aromatic; 4- Very aromatic5- Extremely aromatic
Acceptability: 1- dislike very much; 2- dislike moderately; 3- like; 4- like moderately; 5- like very much

SUMMARY, CONCLUSION AND RECOMMENDATION

Summary

This study aimed to determine the growth and yield performance of soybean accession in Pacso, Kabayan, Benguet condition; determine the best soybean accession/s based on the yield and resistance to pest and disease and determine the farmer acceptability. This was conducted at Pacso, Kabayan, Benguet condition from.

Significant differences among the soybean accessions were observed on the number of days from sowing to emergence, emergence to flowering, emergence to first harvest, plant vigor at 30 and 60 days after planting, number of seeds per pods, width of pods, length of pods, weight of pods, weight of marketable yield, total yield per plot, computed fresh pod yield per hectare, soybean rust and acceptability.

Among the AVRDC soybean accessions, AGS 433 was the earliest to flower, produced tallest plants. It also produced the longest and heaviest one-seeded pods. AGS 439 produced widest, longest one-, two- and three-seeded pods. AGS 435 was earliest to flower. On general acceptability, AGS 440 was liked moderately.

As to the performance of the local variety compared of the AVRDC accessions, it was observed that the local variety emerged earlier, produced taller plants and had heaviest marketable pods.

Conclusion

Among the soybean accessions from AVRDC, AGS 439 and AGS 433 are the best in terms of earliness to flower and first to pod formation. The accession also produced tallest plant, widest, longest, heaviest and most acceptable pods.

Though the local variety was the earliest to emerged, produced the heaviest marketable pods and tallest plants. It was disliked moderately.

Recommendation

The different soybean accessions are adapted under Pacso, Kabayan, Benguet condition. However, the yield was low which could be due to unfavorable climatic conditions during the conduct of the study. It is therefore recommended that the accessions will be planted as lately as August so flowering will coincide with short days (November to December) soybean being a short day plant.

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APPENDICES

Appendix 1. Number of days from sowing to emergence

ACCESSION	REPLICATION 1	11	11	TOTAL	MEAN
AGS 432	8	9	8	25	8
AGS 433	8	8	7	23	8
AGS 434	8	8	8	24	8
AGS 435	8	8	7	23	8
AGS 436	8	9	8	25	8
AGS 437	8	8	8	24	8
AGS 438	8	8	8	24	8
AGS 439	8	8	8	25	8
AGS 440	8	8	8	24	8
AGS 292	8	8	8	23	8
Local Check	7	7	7	21	7
TOTAL	87	89	85	261	

ANALYSIS OF VARIANCE

SOURCE OF VARIANCE	DEGREE OF FREEDOM	SUM OF SQUARE	MEAN OF SQUARE	COMPUTED F	TABULATED F 0.05	TABULATED F 0.01
Block	2	0.727	0.364			
Variety	10	4.727	0.473	2.89*	2.35	3.37
Error	20	3.273	0.164			
TOTAL	32	8.727				

*- Significant

Coefficient of Variation (CV) 5.11%

Appendix 2. Number of days from emergence to flowering

VARIETY	REPLICATION 1	11	111	TOTAL	MEAN
AGS 432	39	38	39	116	39
AGS 433	4	39	41	12	40
AGS 434	39	38	38	115	38
AGS 435	4	4	41	121	40
AGS 436	34	33	34	101	34
AGS 437	36	35	36	107	36
AGS 438	34	34	35	103	34
AGS 439	33	35	34	102	34
AGS 440	38	38	36	112	37
AGS 292	36	34	34	14	35
Local Check	47	48	47	142	47
TOTAL	416	412	415	1240	

ANALYSIS OF VARIANCE

SOURCE OF VARIANCE	DEGREE OF FREEDOM	SUM OF SQUARE	MEAN OF SQUARE	COMPUTED F	TABULATED F 0.05	TABULATED F 0.01
Block	2	0.788	0.394			
Variety	10	483.333	48.333	73.16**	2.35	3.37
Error	20	13.212	0.661			
TOTAL	32	497.333				

**-Significant

Coefficient of Variation (CV) 2.16%

Appendix 3. Number of days from flowering to pod setting.

VARIETY	REPLICATION 1	11	111	TOTAL	MEAN
AGS 432	6	6	6	18	6
AGS 433	6	6	5	17	6
AGS 434	5	5	6	16	5
AGS 435	6	6	5	17	6
AGS 436	7	7	6	20	7
AGS 437	5	6	5	16	5
AGS 438	7	6	5	18	6
AGS 439	6	5	6	17	6
AGS 440	7	6	6	19	6
AGS 292	5	6	5	16	5
Local Check	6	6	5	17	6
TOTAL	66	65	60	191	

ANALYSIS OF VARIANCE

SOURCE OF VARIANCE	DEGREE OF FREEDOM	SUM OF SQUARE	MEAN OF SQUARE	COMPUTED F	TABULATED F 0.05	0.01
Block	2	1.879	0.939			
Variety	10	5.515	0.552	1.80^{ns}	2.35	3.37
Error	20	6.121	0.306			
TOTAL	32	13.515				

ns - Not significant

Coefficient of Variation (CV) 9.56%

Appendix 4. Number of days from emergence to first harvest

VARIETY	REPLICATION 1	11	111	TOTAL	MEAN
AGS 432	72	71	71	215	72
AGS 433	72	72	73	217	72
AGS 434	72	72	72	216	72
AGS 435	72	72	73	217	72
AGS 436	72	71	72	215	72
AGS 437	72	72	72	216	72
AGS 438	71	72	72	216	72
AGS 439	71	72	72	215	72
AGS 440	72	72	72	216	72
AGS 292	73	72	72	217	72
Local Check	73	74	73	220	73
TOTAL	793	792	795	2380	

ANALYSIS OF VARIANCE

SOURCE OF VARIANCE	DEGREE OF FREEDOM	SUM OF SQUARE	MEAN OF SQUARE	COMPUTED F	TABULATED F 0.05	0.01
Block	2	0.424	0.212			
Variety	10	6.848	0.685	3.23*	2.35	3.37
Error	20	4.242	0.212			
TOTAL	32	11.515				

*- Significant

Coefficient of Variation (CV) 0.64%

Appendix 5. Number of days from emergence to last harvest

VARIETY	REPLICATION 1	11	111	TOTAL	MEAN
AGS 432	85	84	85	254	85
AGS 433	84	85	86	255	85
AGS 434	85	85	85	255	85
AGS 435	85	85	86	256	85
AGS 436	85	84	85	254	85
AGS 437	85	85	85	255	85
AGS 438	85	85	85	255	85
AGS 439	84	85	85	254	85
AGS 440	85	85	85	255	85
AGS 292	86	85	85	256	85
Local Check	86	86	86	258	86
TOTAL	935	934	938	2607	

ANALYSIS OF VARIANCE

SOURCE OF VARIANCE	DEGREE OF FREEDOM	SUM OF SQUARE	MEAN OF SQUARE	COMPUTED F	TABULATED F 0.05	0.01
Block	2	0.788	0.394			
Variety	10	4.545	0.455	2.0^{ns}	2.35	3.37
Error	20	4.545	0.227			
TOTAL	32	9.879				

^{ns}- Not significant

Coefficient of Variation (CV) 0.56%

Appendix 6. Initial plant height (cm)

VARIETY	REPLICATION 1	11	111	TOTAL	MEAN
AGS 432	11.86	11.04	14.34	37.24	12.41
AGS 433	14.68	13.38	14.84	42.90	14.30
AGS 434	12.86	12.78	12.10	37.72	12.58
AGS 435	14.20	13.10	14.98	42.28	14.09
AGS 436	12.54	13.16	13.56	39.26	13.09
AGS 437	12.64	13.80	13.92	40.36	13.45
AGS 438	12.84	14.50	13.80	41.14	13.71
AGS 439	11.70	12.44	12.16	36.30	12.10
AGS 440	13.26	13.16	14.04	40.46	13.49
AGS 292	14.26	14.3	15.80	44.36	14.79
Local Check	11.56	11.36	11.62	34.54	11.51
TOTAL	142.40	143.02	151.16	436.58	

ANALYSIS OF VARIANCE

SOURCE OF VARIANCE	DEGREE OF FREEDOM	SUM OF SQUARE	MEAN OF SQUARE	COMPUTED F	TABULATED F 0.05	0.01
Block	2	4.345	2.172			
Variety	10	29.990	2.999	5.87**	2.35	3.37
Error	20	10.213	0.511			
TOTAL	32	44.546				

**-highly significant   Coefficient of Variation (CV) 5.40%

Appendix 7. Final plant height (cm)

VARIETY	REPLICATION 1	11	111	TOTAL	MEAN
AGS 432	15.34	14.72.	17.18	47.24	15.75
AGS 433	23.70	22.04	22.62	68.37	22.79
AGS 434	18.56	17.46	18.08	54.10	18.03
AGS 435	21.02	20.42	23.36	64.80	21.60
AGS 436	20.34	20.16	20.86	61.36	20.45
AGS 437	17.78	19.06	18.44	55.28	18.43
AGS 438	16.86	20.66	18.06	55.58	18.58
AGS 439	14.58	14.28	14.32	43.18	14.39
AGS 440	17.64	18.54	16.24	52.42	17.47
AGS 292	17.50	18.60	19.30	55.40	18.47
Local check	21.72	23.14	24.76	69.62	23.21
TOTAL	205.04	209.08	213.22	627.34	

ANALYSIS OF VARIANCE

SOURCE OF VARIANCE	DEGREE OF FREEDOM	SUM OF SQUARE	MEAN OF SQUARE	COMPUTED F	TABULATED F 0.05	0.01
Block	2	3.042	1.521			
Variety	10	230.441	23.044	18.64**	2.35	3.37
Error	20	24.731	1.237			
TOTAL	32	258.214				

**-highly significant

Coefficient of Variation (CV) 5.85%

Appendix 8. Plant Vigor at 30 days after planting

VARIETY	REPLICATION 1	11	111	TOTAL	MEAN
AGS 432	1	1	2	4	1
AGS 433	2	2	2	6	2
AGS 434	2	2	2	6	2
AGS 435	2	2	2	6	2
AGS 436	2	2	2	6	2
AGS 437	2	2	2	6	2
AGS 438	2	2	2	6	2
AGS 439	2	2	2	6	2
AGS 440	2	2	2	6	2
AGS 292	2	2	2	6	2
Local Check	2	2	3	7	2
TOTAL	21	21	23	65	

ANALYSIS OF VARIANCE

SOURCE OF VARIANCE	DEGREE OF FREEDOM	SUM OF SQUARE	MEAN OF SQUARE	COMPUTED F	TABULATED F 0.05	0.01
Block	2	0.242	0.121			
Variety	10	1.636	0.164	3.0*	2.35	3.37
Error	20	1.091	0.055			
TOTAL	32	2.970				

*-signmificant Coefficient of Variation (CV) 11.86%

Appendix 12. Number of one-seeded pods

VARIETY	REPLICATION 1	11	111	TOTAL	MEAN
AGS 432	30	27	35	92	31
AGS 433	61	107	115	283	94
AGS 434	57	43	50	150	50
AGS 435	53	73	65	191	64
AGS 436	37	48	51	136	45
AGS 437	47	56	54	157	52
AGS 438	59	54	44	157	52
AGS 439	48	78	83	209	70
AGS 440	48	41	49	138	46
AGS 292	58	66	94	218	73
Local Check	74	198	224	496	165
TOTAL	572	791	864	2227	

ANALYSIS OF VARIANCE

SOURCE OF VARIANCE	DEGREE OF FREEDOM	SUM OF SQUARE	MEAN OF SQUARE	COMPUTED F	TABULATED F 0.05	0.01
Block	2	4198.606	2099.303			
Variety	10	40242.242	4024.224	6.48**	2.35	3.37
Error	20	12423.394	621.170			
TOTAL	32	56864.242				

**-highly significant Coefficient of Variation (CV) 26.02%

Appendix 13. Number of two-seeded pods

VARIETY	REPLICATION 1	11	111	TOTAL	MEAN
AGS 432	41	26	26	96	31
AGS 433	43	78	62	183	61
AGS 434	41	39	39	119	40
AGS 435	46	45	54	145	48
AGS 436	31	46	47	124	41
AGS 437	42	37	21	100	33
AGS 438	70	53	58	181	60
AGS 439	81	87	81	249	83
AGS 440	44	50	36	130	43
AGS 292	54	45	46	145	48
Local Check	184	235	212	631	210
TOTAL	677	741	682	2100	

ANALYSIS OF VARIANCE

SOURCE OF VARIANCE	DEGREE OF FREEDOM	SUM OF SQUARE	MEAN OF SQUARE	COMPUTED F	TABULATED F 0.05	0.01
Block	2	230.364	115.182			
Variety	10	77546.303	7754.630	59.31**	2.35	3.37
Error	20	2614.970	130.748			
TOTAL	32	80391.636				

**-highly significant Coefficient of Variation (CV) 17.97%

Appendix 14. Number of three-seeded pods

VARIETY	REPLICATION 1	11	111	TOTAL	MEAN
AGS 432	24	4	7	13	4
AGS 433	6	18	13	37	12
AGS 434	10	2	3	7	2
AGS 435	10	4	3	10	3
AGS 436	19	7	13	32	11
AGS 437	6	3	3	12	4
AGS 438	12	19	19	57	19
AGS 439	3	9	10	29	10
AGS 440	2	12	7	29	10
AGS 292	6	3	6	15	5
Local Check	2	49	33	106	35
TOTAL	100	130	177	407	

ANALYSIS OF VARIANCE

SOURCE OF VARIANCE	DEGREE OF FREEDOM	SUM OF SQUARE	MEAN OF SQUARE	COMPUTED F	TABULATED F 0.05	0.01
Block	2	41.152	20.576			
Variety	10	2766.909	276.691	13.43**	2.35	3.37
Error	20	412.182	20.609			
TOTAL	32	3220.242				

**- highly significant   Coefficient of Variation (CV) 17.32%

Appendix 15. Width of one-seeded pods (cm)

VARIETY	REPLICATION 1	11	111	TOTAL	MEAN
AGS 432	1.58	1.48	1.62	4.68	1.56
AGS 433	1.66	1.82	1.86	5.34	1.78
AGS 434	1.74	1.72	1.88	5.34	1.78
AGS 435	1.74	1.58	1.90	5.22	1.74
AGS 436	1.62	1.74	1.78	5.14	1.71
AGS 437	1.56	1.64	1.66	4.86	1.62
AGS 438	1.62	1.60	1.72	4.94	1.65
AGS 439	1.90	1.72	1.92	5.54	1.85
AGS 440	1.60	1.74	1.92	5.26	1.75
AGS 292	1.64	1.54	1.76	4.94	1.65
Local Check	1.36	1.42	1.40	4.18	1.39
TOTAL	18.02	18	19.42	55.44	

ANALYSIS OF VARIANCE

SOURCE OF VARIANCE	DEGREE OF FREEDOM	SUM OF SQUARE	MEAN OF SQUARE	COMPUTED F	TABULATED F 0.05	0.01
Block	2	0.106	0.053			
Variety	10	0.517	0.052	6.93**	2.35	3.37
Error	20	0.149	0.007			
TOTAL	32	0.772				

**- highly significant Coefficient of Variation (CV) 5.12%

Appendix 16. Width of two-seeded pods (cm)

VARIETY	REPLICATION 1	11	111	TOTAL	MEAN
AGS 432	1.54	1.50	1.40	4.44	1.48
AGS 433	1.68	1.58	1.70	4.96	1.65
AGS 434	1.68	1.68	1.80	5.16	1.72
AGS 435	1.54	1.64	1.60	4.78	1.59
AGS 436	1.78	1.66	1.76	5.20	1.73
AGS 437	1.48	1.44	1.64	4.56	1.52
AGS 438	1.66	1.54	1.64	4.84	1.61
AGS 439	1.78	1.70	1.66	5.14	1.71
AGS 440	1.82	1.80	1.90	5.52	1.84
AGS 292	1.56	1.70	1.60	4.86	1.62
Local Check	1.42	1.32	1.36	4.10	1.37
TOTAL	17.94	17.56	18.06	53.56	

ANALYSIS OF VARIANCE

SOURCE OF VARIANCE	DEGREE OF FREEDOM	SUM OF SQUARE	MEAN OF SQUARE	COMPUTED F	TABULATED F 0.05	0.01
Block	2	0.012	0.006			
Variety	10	0.526	0.053	11.91**	2.35	3.37
Error	20	0.088	0.004			
TOTAL	32	0.627				

**-highly significant

Coefficient of Variation (CV) 4.10%

Appendix 17. Width of three-seeded pods (cm)

VARIETY	REPLICATION 1	11	111	TOTAL	MEAN
AGS 432	0	0	1.62	1.62	0.54
AGS 433	1.44	1.54	1.58	4.56	1.52
AGS 434	1.10	1.50	.40	3.00	1.51
AGS 435	1.50	1.55	1.60	4.65	1.55
AGS 436	1.64	1.64	1.70	4.98	1.66
AGS 437	1.70	0	0	1.70	0.57
AGS 438	1.66	1.56	1.62	4.84	1.61
AGS 439	1.66	1.74	1.70	5.10	1.70
AGS 440	1.76	1.68	1.88	5.32	1.77
AGS 292	1.62	0	1.62	3.24	1.08
Local Check	1.42	1.6	1.54	4.56	1.52
TOTAL	15.50	12.81	15.26	43.57	

ANALYSIS OF VARIANCE

SOURCE OF VARIANCE	DEGREE OF FREEDOM	SUM OF SQUARE	MEAN OF SQUARE	COMPUTED F	TABULATED F 0.05	0.01
Block	2	0.674	0.337			
Variety	10	14.281	1.428	5.94**	2.35	3.37
Error	20	4.810	0.241			
TOTAL	32	19.765				

**-highly significant   Coefficient of Variation (CV) 17.80%

Appendix 18. Length of one-seeded pods (cm)

VARIETY	REPLICATION 1	11	111	TOTAL	MEAN
AGS 432	3.38	3. 40	3.40	10.18	3.39
AGS 433	4.04	4.02	4.08	12.14	4.05
AGS 434	3.94	3.78	3.80	11.52	3.84
AGS 435	3.68	3.74	3.88	11.30	3.77
AGS 436	3.80	4 .06	3.86	11.72	3.91
AGS 437	3.64	3.42	3.66	10.72	3.57
AGS 438	4.68	3.92	3.78	12.38	4.13
AGS 439	4.32	3.94	4.26	12.52	4.7
AGS 440	3.68	4.12	3.62	11.42	3.81
AGS 292	3.34	3.44	3.96	10.74	3.58
Local Check	3.68	3.40	3.60	10.68	3.56
TOTAL	42.18	41.24	41.90	125.32	

ANALYSIS OF VARIANCE

SOURCE OF VARIANCE	DEGREE OF FREEDOM	SUM OF SQUARE	MEAN OF SQUARE	COMPUTED F	TABULATED F 0.05	0.01
Block	2	0.042	0.021			
Variety	10	1.931	0.193	3.74**	2.35	3.37
Error	20	1.033	0.052			
TOTAL	32	3.007				

**-highly significant

Coefficient of Variation (CV) 5.99%

Appendix 19. Length of two-seeded pods (cm)

VARIETY	REPLICATION 1	11	111	TOTAL	MEAN
AGS 432	4.52	4.30	4.46	13.28	4.43
AGS 433	4.82	5.00	4.98	14.80	1.93
AGS 434	5.14	5.54	5.22	15.36	5.12
AGS 435	4.80	5.36	4.84	14.46	4.82
AGS 436	5.48	5.18	5.18	15.56	5.19
AGS 437	4.36	4.60	4.58	13.54	4.51
AGS 438	5.78	4.90	5.48	16.44	5.48
AGS 439	5.74	4.82	5.72	16.82	5.61
AGS 440	5.30	5.00	5.66	16.50	5.50
AGS 292	4.94	5.00	5.08	15.02	5.01
Local Check	4.50	4.30	4.58	13.76	4.59
TOTAL	55.38	54.33	55.78	165.49	

ANALYSIS OF VARIANCE

SOURCE OF VARIANCE	DEGREE OF FREEDOM	SUM OF SQUARE	MEAN OF SQUARE	COMPUTED F	TABULATED F 0.05	0.01
Block	2	0.109	0.054			
Variety	10	5.120	0.512	19.0**	2.35	3.37
Error	20	0.539	0.027			
TOTAL	32	5.768				

**-highly significant

Coefficient of Variation (CV) 3.27%

Appendix 20. Length of three-seeded pods (cm)

VARIETY	REPLICATION			TOTAL	MEAN
	1	11	111		
AGS 432	0	0	4.72	4.72	1.57
AGS 433	5.88	5.46	5.44	16.78	5.59
AGS 434	4.58	4.40	5.40	14.38	4.79
AGS 435	5.50	3.64	4.88	14.02	4.67
AGS 436	5.90	6.02	5.78	17.7	5.90
AGS 437	5.34	0	0	5.34	1.78
AGS 438	6.36	6.30	6.46	19.12	6.37
AGS 439	6.44	6.30	6.06	18.8	6.27
AGS 440	6.54	6.44	6.52	19.5	6.50
AGS 292	5.48	0	0	5.48	1.83
Local Check	5.02	4.98	4.92	14.92	4.97
TOTAL	57.04	43.54	50.18	150.76	

ANALYSIS OF VARIANCE

SOURCE OF VARIANCE	DEGREE OF FREEDOM	SUM OF SQUARE	MEAN OF SQUARE	COMPUTED F	TABULATED F	
					0.05	0.01
Block	2	6.077	3.038			
Variety	10	212.155	21.216	8.83**	2.35	3.37
Error	20	48.056	2.403			
TOTAL	32	266.288				

**-highly significant   Coefficient of Variation (CV) 15.63%

Appendix 21. Weight of one-seeded pods (kg)

VARIETY	REPLICATION 1	11	111	TOTAL	MEAN
AGS 432	0.17	0.20	0.28	0.65	0.22
AGS 433	0.49	0.85	0.92	2.26	0.75
AGS 434	0.49	0.32	0.44	1.25	0.42
AGS 435	0.34	0.48	0.51	1.33	0.44
AGS 436	0.34	0.40	0.52	1.26	0.42
AGS 437	0.53	0.45	0.46	1.44	0.48
AGS 438	0.36	0.46	0.39	1.21	0.40
AGS 439	0.34	0.66	0.72	1.72	0.57
AGS 440	0.51	0.41	0.42	1.34	0.45
AGS 292	0.49	0.70	0.77	1.96	0.65
Local Check	0.35	0.98	1.03	2.36	0.79
TOTAL	4.41	5.91	6.46	16.78	

ANALYSIS OF VARIANCE

SOURCE OF VARIANCE	DEGREE OF FREEDOM	SUM OF SQUARE	MEAN OF SQUARE	COMPUTED F	TABULATED F 0.05	0.01
Block	2	0.205	0.102			
Variety	10	0.852	0.085	4.42**	2.35	3.37
Error	20	0.385	0.019			
TOTAL	32	1.441				

**-highly significant

Coefficient of Variation (CV) 27.29 %

Appendix 22. Weight of two-seeded pods (kg)

VARIETY	REPLICATION 1	11	111	TOTAL	MEAN
AGS 432	0.36	0.34	0.36	1.06	0.35
AGS 433	0.67	1.08	0.90	2.65	0.88
AGS 434	0.49	0.48	0.53	1.50	0.50
AGS 435	0.65	0.58	0.46	1.69	0.56
AGS 436	0.54	0.72	0.67	1.93	0.64
AGS 437	0.65	0.59	0.31	1.55	0.52
AGS 438	1.11	0.82	0.83	2.76	0.92
AGS 439	1.30	1.41	1.33	4.04	1.35
AGS 440	0.93	0.70	0.55	2.18	0.73
AGS 292	0.83	0.46	0.71	2.00	0.67
Local Check	1.57	1.93	1.84	5.34	1.78
TOTAL	9.10	9.11	8.49	26.69	

ANALYSIS OF VARIANCE

SOURCE OF VARIANCE	DEGREE OF FREEDOM	SUM OF SQUARE	MEAN OF SQUARE	COMPUTED F	TABULATED F 0.05	0.01
Block	2	0.027	0.014			
Variety	10	5.234	0.523	22.02**	2.35	3.37
Error	20	0.475	0.024			
TOTAL	32	5.737				

**-highly significant Coefficient of Variation (CV) 18.98%

Appendix 23. Weight of three-seeded pods (kg)

VARIETY	REPLICATION 1	11	111	TOTAL	MEAN
AGS 432	0.04	0.08	0.16	0.28	0.09
AGS 433	0.08	0.31	0.24	0.63	0.21
AGS 434	0.05	0.02	0.04	0.11	0.04
AGS 435	0.01	0.07	0.14	0.22	0.07
AGS 436	0.17	0.20	0.23	0.60	0.20
AGS 437	0.06	0.02	0.07	0.15	0.05
AGS 438	0.26	0.28	0.34	0.88	0.29
AGS 439	0.26	0.21	0.19	0.66	0.22
AGS 440	0.18	0.20	0.14	0.52	0.17
AGS 292	0.14	0.19	0.13	0.46	0.15
Local Check	0.37	0.43	0.37	1.17	0.39
TOTAL	1.62	2.01	2.05	5.68	

ANALYSIS OF VARIANCE

SOURCE OF VARIANCE	DEGREE OF FREEDOM	SUM OF SQUARE	MEAN OF SQUARE	COMPUTED F	TABULATED F 0.05	0.01
Block	2	0.010	0.005			
Variety	10	0.349	0.035	13.75**	2.35	3.37
Error	20	0.051	0.003			
TOTAL	32	0.411				

**-highly significant Coefficient of Variation (CV) 29.25%

Appendix 24. Weight of marketable pods (kg)

VARIETY	REPLICATION 1	11	111	TOTAL	MEAN
AGS 432	0.39	0.53	0.44	1.36	0.45
AGS 433	1.04	2.15	1.48	4.67	1.56
AGS 434	0.91	0.81	0.75	2.47	0.82
AGS 435	0.96	1.04	0.68	2.68	0.89
AGS 436	0.89	1.19	1.06	3.14	1.05
AGS 437	1.13	1.00	0.76	2.89	0.96
AGS 438	1.63	1.45	1.35	4.43	1.48
AGS 439	1.85	2.23	1.78	5.86	1.95
AGS 440	1.33	1.19	0.69	3.21	1.07
AGS 292	1.18	1.30	1.15	3.63	1.21
Local Check	2.10	3.06	2.52	7.68	2.56
TOTAL	13.41	15.95	12.66	42.02	

ANALYSIS OF VARIANCE

SOURCE OF VARIANCE	DEGREE OF FREEDOM	SUM OF SQUARE	MEAN OF SQUARE	COMPUTED F	TABULATED F 0.05	0.01
Block	2	0.541	0.270			
Variety	10	10.355	1.035	17.94**	2.35	3.37
Error	20	1.154	0.058			
TOTAL	32	12.050				

**-highly significant   Coefficient of Variation (CV) 18.87%

Appendix 25. Weight of non-marketable pods (kg)

VARIETY	REPLICATION 1	11	111	TOTAL	MEAN
AGS 432	0.18	0.09	0.36	0.63	0.21
AGS 433	0.20	0.09	0.58	0.87	0.29
AGS 434	0.12	0.01	0.26	0.39	0.13
AGS 435	0.04	0.09	0.42	0.55	0.18
AGS 436	0.16	0.13	0.36	0.65	0.22
AGS 437	0.11	0.06	0.08	0.25	0.08
AGS 438	0.10	0.11	0.21	0.42	0.14
AGS 439	0.05	0.05	0.46	0.56	0.19
AGS 440	0.29	0.12	0.42	0.83	0.28
AGS 292	0.28	0.05	0.46	0.79	0.26
Local Check	0.19	0.28	0.72	1.19	0.40
TOTAL	1.62	1.08	4.33	7.03	

ANALYSIS OF VARIANCE

SOURCE OF VARIANCE	DEGREE OF FREEDOM	SUM OF SQUARE	MEAN OF SQUARE	COMPUTED F	TABULATED F 0.05	0.01
Block	2	0.539	0.269			
Variety	10	0.230	0.023	2.24^{ns}	2.35	3.37
Error	20	0.190	0.010			
TOTAL	32	0.960				

^{ns}- Not significant Coefficient of Variation (CV) 15.15%

Appendix 26 . Total yield per plot (kg)

VARIETY	REPLICATION 1	11	111	TOTAL	MEAN
AGS 432	0.57	0.62	0.80	1.99	0.66
AGS 433	1.24	2.24	2.06	5.54	1.85
AGS 434	1.03	0.82	1.01	2.86	0.95
AGS 435	1.00	1.13	1.10	3.23	1.08
AGS 436	1.05	1.32	1.42	3.79	1.26
AGS 437	1.24	1.06	0.84	3.14	1.05
AGS 438	1.73	1.56	1.56	4.85	1.62
AGS 439	1.90	2.28	2.24	6.42	2.14
AGS 440	1.62	1.31	1.11	4.04	1.35
AGS 292	1.46	1.35	1.61	4.42	1.47
Local Check	2.29	3.34	3.24	8.87	2.96
TOTAL	15.13	17.03	16.99	49.15	

ANALYSIS OF VARIANCE

SOURCE OF VARIANCE	DEGREE OF FREEDOM	SUM OF SQUARE	MEAN OF SQUARE	COMPUTED F	TABULATED F 0.05	0.01
Block	2	0.214	0.107			
Variety	10	12.384	1.238	16.32**	2.35	3.37
Error	20	1.517	0.076			
TOTAL	32	14.115				

**-highly significant   Coefficient of Variation (CV) 18.49%

Appendix 27 . Computed fresh pod yield per hectare (t/ha)

VARIETY	REPLICATION 1	11	111	TOTAL	MEAN
AGS 432	1.14	1.24	1.60	3.98	1.33
AGS 433	2.48	4.48	4.12	11.08	3.69
AGS 434	2.06	1.64	2.02	5.72	1.91
AGS 435	2.00	2.26	2.20	6.46	2.15
AGS 436	2.10	2.64	2.84	7.58	2.53
AGS 437	2.48	2.12	1.68	6.28	2.09
AGS 438	3.46	3.12	3.12	9.70	3.23
AGS 439	3.80	4.56	4.48	12.84	4.28
AGS 440	3.24	2.62	2.22	8.08	2.69
AGS 292	2.92	2.70	3.22	8.84	2.95
Local Check	4.58	6.68	6.48	17.74	5.91
TOTAL	30.26	34.06	33.98	98.30	

ANALYSIS OF VARIANCE

SOURCE OF VARIANCE	DEGREE OF FREEDOM	SUM OF SQUARE	MEAN OF SQUARE	COMPUTED F	TABULATED F 0.05	0.01
Block	2	0.742	0.371			
Variety	10	49.737	4.974	16.01**	2.35	3.37
Error	20	6.213	0.311			
TOTAL	32	56.213				

**-highly significant Coefficient of Variation (CV) 18.66%

Appendix 28 . Reaction to soybean Rust

VARIETY	REPLICATION 1	11	111	TOTAL	MEAN
AGS 432	2	3	2	7	2
AGS 433	3	3	3	9	3
AGS 434	2	2	2	6	2
AGS 435	2	2	3	7	2
AGS 436	3	3	3	9	3
AGS 437	2	2	2	6	2
AGS 438	3	2	3	8	3
AGS 439	3	2	3	8	3
AGS 440	2	2	2	6	2
AGS 292	3	2	2	7	2
Local Check	2	2	2	6	2
TOTAL	27	25	27	79	

ANALYSIS OF VARIANCE

SOURCE OF VARIANCE	DEGREE OF FREEDOM	SUM OF SQUARE	MEAN OF SQUARE	COMPUTED F	TABULATED F 0.05	0.01
Block	2	0.242	0.121			
Variety	10	4.545	0.455	2.94*	2.35	3.37
Error	20	3.091	0.155			
TOTAL	32	7.879				

*-significant

Coefficient of Variation (CV) 16.42%

Appendix 29 . Reaction to leaf miner

VARIETY	REPLICATION 1	11	111	TOTAL	MEAN
AGS 432	2	2	2	6	2
AGS 433	2	2	2	6	2
AGS 434	2	2	3	7	2
AGS 435	3	3	3	9	3
AGS 436	3	3	2	8	3
AGS 437	2	2	2	6	2
AGS 438	3	2	3	8	3
AGS 439	2	2	2	6	2
AGS 440	2	2	2	6	2
AGS 292	3	2	2	7	2
Local Check	2	2	3	6	2
TOTAL	26	24	26	76	

ANALYSIS OF VARIANCE

SOURCE OF VARIANCE	DEGREE OF FREEDOM	SUM OF SQUARE	MEAN OF SQUARE	COMPUTED F	TABULATED F 0.05	TABULATED F 0.01
Block	2	0.242	0.121			
Variety	10	3.636	0.364	2.34^{ns}	2.35	3.37
Error	20	3.091	0.155			
TOTAL	32	6.970				

^{ns}- Not significant

Coefficient of Variation (CV) 17.07%

Appendix 30 . Aroma of the 11 soybean accession

VARIETY	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	TOTAL	MEAN
AGS 432	4	2	2	2	2	5	3	2	2	2	2	1	3	2	2	36	2
AGS 433	3	3	2	2	2	4	4	3	2	2	1	1	3	2	1	35	2
AGS 434	3	4	3	2	3	4	4	3	2	2	1	2	2	1	1	37	3
AGS 435	4	1	3	3	2	4	3	3	3	2	1	3	3	2	3	40	3
AGS 436	3	2	2	2	3	2	2	2	2	3	2	1	1	2	1	30	2
AGS 437	3	2	2	1	3	2	4	1	2	2	2	2	2	1	2	31	2
AGS 438	3	2	3	2	3	2	5	3	2	1	1	2	2	1	3	35	2
AGS 439	4	2	2	2	2	2	5	1	3	3	1	1	1	2	1	32	2
AGS 440	4	3	2	1	2	2	4	2	3	1	1	1	2	2	4	34	2
AGS 292	3	2	1	2	2	2	4	3	2	2	2	2	2	2	2	33	2
Local Check3	3	2	1	1	2	4	2	2	1	1	4	1	2	3		32	2
TPTAL	37	26	24	20	25	31	42	25	25	21	15	20	22	20	23		

ANALYSIS OF VARIANCE

SOURCE OF VARIANCE	DEGREE OF FREEDOM	SUM OF SQUARE	MEAN OF SQUARE	COMPUTED F	TABULATED F 0.05	TABULATED F 0.01
Block	14	62.364	4.455			
Variety	10	5.661	0.566	0.98^{ns}	1.88	2.46
Error	140	80.703	0.576			
TOTAL	160	148.727				

^{ns}- Not significant

Coefficient of Variation (CV) 13.41%

Appendix 31 . Acceptability of the 11 soybean accession

VARIETY	PANELIST 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	TOTAL	MEAN
AGS 432	2	3	3	3	3	1	3	4	3	3	3	3	3	2	3	42	3
AGS 433	2	3	3	3	3	4	4	4	4	2	4	3	4	2	2	47	3
AGS 434	2	4	4	4	5	4	3	3	5	2	5	2	2	1	3	49	3
AGS 435	3	3	3	2	3	2	3	4	4	3	3	2	3	1	1	40	3
AGS 436	4	3	3	3	3	3	3	3	3	4	2	2	4	2	3	45	3
AGS 437	4	2	3	3	3	3	3	5	5	4	2	2	5	1	2	47	3
AGS 438	3	2	3	4	5	4	3	3	3	5	2	2	2	3	3	47	3
AGS 439	3	2	3	3	3	4	3	4	4	4	2	3	5	2	3	48	3
AGS 440	1	3	4	2	2	3	3	4	5	4	4	2	5	2	2	64	4
AGS 292	1	3	3	3	2	4	3	3	3	3	1	3	3	1	3	39	3
Local Chec	3	1	2	2	1	2	3	2	2	2	4	4	2	2	1	33	2
TPTAL	37	26	24	20	25	31	42	25	25	21	15	20	22	20	23		

ANALYSIS OF VARIANCE

SOURCE OF VARIANCE	DEGREE OF FREEDOM	SUM OF SQUARE	MEAN OF SQUARE	COMPUTED F	TABULATED F 0.05	TABULATED F 0.01
Block	14	40.036	2.860			
Variety	10	15.927	1.593	2.08*	1.88	2.46
Error	140	107.164	0.765			
TOTAL	160	163.127				

*-significant

Coefficient of Variation (CV) 29.89%