BIBLIOGRAPHY

DAPROZA, LEO C. APRIL 2009. Evaluation of True Potato Seed Progenies for Organic Production in La Trinidad, Benguet. Benguet State University.

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ABSTRACT

The study was conducted to: determine the agronomic characteristics of true potato seed progeny for organic production; identify TPS progeny based on tuber qualities; and to select the best tuber families with good yield and resistant to pests and diseases for organic production. True potato seeds were collected from the different potato producing areas in Benguet Province.

Seven progenies were evaluated under screen house and field conditions. Differences among the progenies were noted for vigor and tuber yield. TPS 15 potato progeny had the highest percent survival while TPS 14 and TPS 11 potato progenies had the least. Potato progenies TPS 15, TPS 12, and TPS 16 were observed to be vigorous and resistant to late blight.

The highest yielding progeny was TPS 15 with 4,380 g/15m^2. Uniformity of tuber qualities, length of stolon and tuber set were not significantly different among the potato progenies TPS 16 progeny had the most uniform flesh color. TPS 15 produced the highest number of tubers per hill.

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INTRODUCTION

Potato which is a major food crop of temperate countries has the potential to substitute or supplement rice, especially at present day that the Philippines are now facing chronic shortage on rice. Potato has a desirable characteristic including high nutritive value and a short life which is good substitute for rice.

In the Philippines, potato is grown in Benguet, Bukidnon, Pangasinan, Lanao Del Norte, Nueva Ecija and North Cotabato. Among these provinces, Benguet is the major producer of potato because of its climate which is suitable to the production of tubers (Kalaw, 1987).

In the midst of 1960's, the Philippines adopted the Green Revolution technology for agricultural development. This technology had been successful in alleviating hunger and malnutrition in the country, however, the excessive use of synthetic fertilizers, pesticides and herbicides have contributed to soil degradation, depletion of ground water, increase in the virulence of pests and diseases and genetic erosion.

In the highlands, potato production has a serious problem on the occurrence of pests and diseases due to the traditional method of producing seed tubers as planting materials for successive generations. Another problem is soil degradation due to the continuous application of synthetic chemicals in crop production. These practices of farmers, however, results in reduction of crop yield.

An alternative solution to solve these problems is the use of true potato seed as planting materials under organic production. A true potato seed is a cheap source of planting material of high quality as it reduces the transmission of seed borne pathogens (Viet, 1993). It also minimizes transportation and storage problems, thus, the use of true potato seeds minimize the cost of seeds (Ganga, *et al*. 1998). According to Fehr (1987), a few hundred grams of true potato seeds (TPS) would substitute for tons of seed tubers. True potato seeds (TPS) technology therefore, could be used successfully as planting material in the potato production.

In addition, Balaoing (2006) stated that organic materials application improves soil's physical, chemical and biological conditions that can enhance the quality of potato production. By growing organic crops, farmers will increase their incomes since the price of such crops can reach two or three times more than the conventionally grown crops.

It is therefore important to conduct researches on evaluation and screening of potato plants under organic production to identify varieties suited to the locality due to the changing agro-climatic conditions and at the same time replace old varieties that yield have degenerated.

The result of this study will provide idea for the farmers in the highlands on the importance of true potato seed as planting material under organic farming.

The study was conducted to:

1. determine the agronomic characteristics of the true potato seeds (TPS) progeny for organic production;

2. identify true potato seeds progeny based on the tuber qualities; and

3. select the best tuber families with good yield and resistance to pests and diseases for organic production.

Time and Place of Study

The study was conducted at Benguet State University Experimental Station, Balili La Trinidad, Benguet from October 2008 to March 2009.

REVIEW OF LITERATURE

True Potato Seeds

True potato seeds (TPS) was obtained from berries growing on top portion of the potato plant while a single berry may contain up to several hundred seeds (CIP, 1984). Pungsayan *et al*. (1985) states that true potato seeds are sometimes called botanical seeds because it is the result of sexual reproduction.

The use of true potato seeds is a new technology developed during the mid 1980's by the Food Crops Research Institute (FCRI) with the open pollinated progeny of the cultivar CFK-69-1 and Atzimba which is designed to provide a low cost alternative production and substitute for virus free tuber stock which are very expensive and difficult to produce (Rasco *et al*., 1997).

At present, research efforts by potato workers in developing countries are in progress towards the development of true potato seeds (TPS) technology as an alternative to the conventional mode of potato propagation by using seed tubers (Thakur *et al*., 1992).

In the Philippines, true potato seeds become a useful production especially in Mindanao, where potato yields are quite low due to poor seed tuber quality, in which at present , transplanting and the use of seed tubers produced from true potato seeds are now employed in this area (CIP, 1984).

Advantages and Disadvantages of Using True Potato Seeds (TPS)

Production from true potato seeds instead of seed tubers would have many advantages. Since the country does not regularly import fresh batch of seeds and there is no local systems for producing clean stocks, farmers had to use seed stocks that are progressively degenerated which is low in quality that results to reduction of yield year after year, but the true potato seed technology provides an easy way of renewing seeds stocks on a regular basis (Ganga *et al*., 1998).

In an experiment conducted to compare the amount of virus infection of a true potato seed and clonal crop potatoes, result revealed that diseases like PVS, PVM and PVZ have low incidence in fields grown of true potato seed crops compared to fields grown with clonal crop potatoes (Viet, 1993).

The true potato seed technology has been tried and verified and was found to have the following advantages: it is a clean source of planting material either as transport or seedling tuber, easy to transport and handle, cheap and significantly reduces the cost of production compared to the use of seed tubers (Ganga,*et al*., 1998).

True potato seed production, however, has the disadvantages of labor and time requirement, the need to ensure a sufficient supply of botanical seed which is not easy to produce in the main potato growing areas of the country, and potential non-uniformity in the produce (Singh *et al*., 1992).

Importance of Organic Farming

Organic farming can be defined as an approach to agriculture where the aim is to create integrated, humane, environmentally and economically sustainable agricultural production systems, which maximize reliance on farm-derived renewable resources and management of ecological processes and interactions, so as to provide acceptable levels of crops, livestock and human condition, production from pest and diseases and appropriate return to the human and other resources employed (Lampkin, 1994).

Glen *et al*. (1995) states that organic farming is regarded much more as away of thinking and of living than just technology used to produce food. Kristiansen *et al.* (1994) defined organic farming as holistic production management system which promotes and enhances agro-ecosystem health, including biodiversity, biological cycles, and soil biological activity.

Balaoing (2006) stated that organic material application improves the soil physical, chemical and biological conditions that can probably enhance the quality of potato tuber processing.

The key characteristics of organic farming include protecting the long-term fertility of the soils by maintaining organic matter levels by fostering soil biological activity and careful mechanical intervention and providing crop nutrients indirectly by using relatively insoluble nutrient sources which are made Available to the plant by the action of soil microorganisms (Lampkin *et al*., 1994). Furthermore, Newton (2004) claimed that organic farming has to be both productive, ecological and the resulting food has to be excellent.

<u>Definition of Compost</u>

Composting is the natural processes of decomposing and recycling organic materials into humus-rich soil amendment by the successive action of bacteria, fungi, actinomycete, and earthworms (Chen *et al*., 2005). Compost is partially decomposed plant matter which, when added to the soil, can improve the soil structure and add nutrients to the soil.

Importance of Compost

Compost does several things to benefit the soil that inorganic fertilizers can not do, in sandy soils, compost act as a sponge to help retain water in the soil that would otherwise drain down below to reach the plant roots which can help to protect the plants against droughts (Loque, 2007).

Palaroan (2006) cited that compost contains reasonable levels of nitrogen, phosphorus, and potassium silica and enough carbon or fibrous materials to improve the physical, chemical, biological properties of soil and granulates the soil particles.

Compost is an effective way to increase healthy plant production, help save money, reduce the use of chemical fertilizers, conserve natural resources and when correctly applied it has the beneficial effects of soil properties, thus creating suitable conditions for root development and consequently promoting higher yield and higher quality crops (Chen *et al*., 2005). Pears *et al*. (1999) stated that when compost added to the soil, compost feeds the teeming microscopic soil life, as a result, plant foods are made available and the soil health and structure is improved.

MATERIALS AND METHODS

Germination of True Potato Seed

True potato seeds were directly sown in plastic trays in a sterilized medium compost of sandy loam and ash (2:1 ratio). After sowing, watering was done as often as necessary. Two weeks after emergence, the seedlings were pricked in a banana pot using the same media.

The Farm

The experimental area used was transitioned to organic production seven years ago. Rotations of crops such as beans, potato, and garden pea were practiced. The land was fallowed for at least six months before the cropping season from September to December. Corn was planted on the borders of the farm to serve as barrier while marigold was planted in between beds to serve as pest repellants.

Land Preparation and Organic Fertilizer Application

The area was cleared of weeds and the soil was cultivated using a tractor. Plots were prepared measuring 1 m x 5 m long. Mushroom compost at a rate of 10 kg/5 m^2 was evenly incorporated within the plot one month before transplanting.

Transplanting

The seedlings were transplanted six weeks after germination when the seedlings have five to six leaves. Seedlings were transplanted within the side of the plot with their roots covered with seed bed mixture. One seedling was transplanted per hill at a distance of 25 cm x 30 cm between rows and hills. After transplanting, seedlings were watered immediately to prevent wilting and to ensure a better chance of survival.

Lay-out of the Experiment

An area of 105 m^2 was prepared and subdivided into three blocks that served as replication (Figure 1). Each block was subdivided into 7 plots measuring 1 m x 5 m representing the seven treatments. The experiment was laid-out following the Randomized Complete Block Design (RCBD) with three replications as follows:

Progenies	Locality of Collection
TPS 10	Buguias, Benguet
TPS 11	Mankayan, Benguet
TPS 12	Buguias, Benguet
TPS 13	Buguias, Benguet
TPS 14	Sagpat, Benguet
TPS 15	Buguias, Benguet
TPS 16	Sagpat, Benguet

Cultural Management Practices

All necessary cultural management practices such as fertilizer application, irrigation and hilling-up were done uniformly to all plots as necessary. Mushroom compost was applied basally (10 kg / 5m^2), two weeks before transplanting. No synthetic pesticides were used.

Figure 1. Overview of the study area at 45 days after transplanting

Data Gathered

1. Climatic data. Meteorological data were taken from BSU- PAG-ASA Office.

2. Soil chemical properties. This was taken before planting and after harvest.

A. Screen house

3. Uniformity of seedlings. Plant vigor was taken at 28 days after sowing using the rating scale:

Scale	Description
1	not uniform
3	moderately uniform
5	uniform

4. Seedling vigor. Plant vigor was taken at 28 days after sowing using the CIP rating scale:

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 vigor
3	Better than less vigorous	Moderately vigorous
4	Plants are moderately strong With robust stems and leaves	Vigorous
5	Plants are strong with robust stems and leaves; leaves are light to dark green in color.	Highly vigorous

B. Field

5. Plant survival. This is the percentage of plants that survived taken at 30 days after transplanting (DAT) using the formula:

$$\%Survival = \frac{\text{Number of Transplants Survived}}{\text{Total Numbers of Plants Transplanted}} \times 100$$

6. Plant vigor. Plant vigor was taken 30 and 45, 60 and 75 days after transplanting using the CIP rating scale:

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 vigor
3	Better than less vigorous	Moderately vigorous
4	Plants are moderately strong with robust stems and leaves	Vigorous
5	Plants are strong with robust stems and leaves; leaves are light to dark green in color.	Highly vigorous

7. Late blight infection. Rating was done at 30, 45, 60 and 75 days after planting using CIP (Henfling, 1982) rating scale as follows:

Blight	CIP Scale	Description
0	1	No blight to be seen
0-1-1	1	Very few plants in large treatments with lesions. Not more 2 lesions per 10m of row (+/-30 plants).
1.1-3	2	Up to 10 small lesions per plant.
3.1-10	3	Up to 30 small lesions per plant

Blight	CIP Scale	Description
10.1-24	4	or up to 1 each leaflets attached. Most plants are visibly attached by late blight, leaflets infected. multiple infections per leaflets.
25-49	5	Nearly every leaflet with lesions. Multiple infections per leaflets are common. Field or plots look green, but all plants in pots are blighted.
50-74	6	Every plant blighted and half the leaf area destroyed by blight fields look green –flecked, and brown, blight is very obvious.
75-90	7	As previous, but ¾ of each plant blighted. Lower branches maybe overwhelmingly killed off, and the only green leaves, if any, are spindly due to extensive foliage loss. Field looks neither brown nor green.
91-97	8	Some leaves and most stems are green. Field looks brown with some leaves patches.
97.1-99.9	9	Few green leaves almost all with blight lesions remain. Many stem lesions look brown.
100	10	All leaves and stems are dead.

Description: 1-Highly resistant; 2-3-Resistant; 4-5-Moderately resistant; 6-7-Moderartely susceptible; 8-9-Susceptible.

8. Yield and Yield Components

a. Number and weight of marketable tubers per plot (g).All tubers that have marketable size, marble size, not malformed, free from cuts, cracks and without more than 10 % greening of the total surface were counted and weighed at harvest.

b. Number and weight of non-marketable tubers per plot (g). These were obtained by counting and weighing all tubers that are malformed, damaged by pests and diseases and those with more than 10 % greening.

c. Total yield per plot (g). The sum of the weight of marketable and non-marketable tubers were counted and weighed.

d. Uniformity of tubers. This was obtained after harvest using the following rating scale:

Scale	Description
1	not uniform
3	moderately uniform
5	highly uniform

e. Stolon length. This was taken after harvest using the following rating scale:

Scale	Description
3	short (1-50 cm)
5	medium (51- 100 cm)
7	long (101 and above)

f. Maturity. This was obtained after harvest using the following rating scale:

Scale	Description
3	early
5	medium
7	late

g. Tuber set. This was taken after harvest using the following rating scale:

Scale	Description
3	few (0-3 tubers per hill)
5	medium (4-6tubers per hill)
7	many (7-10 tubers per hill)

Analysis of Data

The data gathered were analyzed using the analysis of variance (ANOVA) for Randomized Complete Block Design (RCBD). The significance of differences among treatment mean were tested using the Duncan's Multiple Range Test (DMRT) at 5 % level of significance.

RESULTS AND DISCUSSION

Climatic Data

The monthly mean temperature, relative humidity and sunshine duration that prevailed during the study was shown in Table 1. The monthly mean air temperature ranged from 24.25 to 25.27 ^{0}C. During the month of March, air temperature was slightly higher than the other months of the growing season. On the other hand, relative humidity was lowest during the month of December and abruptly increased in the succeeding months. The mean relative humidity was 84.5 %. HARRDEC (1996) reported that the optimum temperature and relative humidity for potato production ranged from 17-22 ^{0}C and 86 %, respectively. Rainfall was recorded throughout the study which may have contributed to the occurrence of diseases especially late blight.

Chemical Properties of the Soil

Percent soil organic matter. Table 2 shows that the percent soil organic matter before planting was 3.0 %. According to Lambert (1996), the normal percent organic matter for potato production ranged from 1-4 %. This means that the organic matter before planting was sufficient. Chen *et al.* (2005) stated that organic matter content of the soil is usually used as an index of soil fertility.

It was observed that the amount of organic matter of the soil before planting and after harvesting is the same despite the application of compost. This result was not expected since potato needs high amount of nutrients. This could be due to the application of mushroom compost in the area. According to Chen *et al.* (2005) the mushroom compost has a high fibrous material content that improves physical properties and biological activity.

Soil pH. The pH of the soil before and after harvest was 5.6 which favors the growth of potato since the optimum pH for potato is 5.6 to 6.5 (HARRDEC, 1996).

Percent Nitrogen. No change in the amount of nitrogen content of the soil was observed. Although, according to Krisma (2002) nitrogen is crucial for several physiological and biochemical reactions during vegetative and reproductive phase of the plant, that implies that the nitrogen applied through the mushroom compost is enough for growing the potato.

Phosphorus (ppm). As shown in Table 2, there was a slight decrease in the phosphorus content of the soil at harvest. The initial and final phosphorus content of the medium was 3500 and 3200 ppm, respectively. The decrease could be due to high phosphorus requirement of the plants. HARRDEC (1996) reported that the phosphorus is needed during the early development of the crop, early tuberization and needed to increase the number of tubers produced per plant. They further stated that the nutrient requirement of potato is 140-140-140 NPK kg / ha.

Table 1. Climatic data gathered during the conduct of the study

MONTH	AIR TEMPERATURE (^{O}C)	RELATIVE HUMIDITY (%)	RAINFALL (mm)	SUNSHINE DURATION (min)
December	24.5	82	0.1	369.8
January	24.6	85	0.03	349.8
February	24.25	85.25	3.47	387.2
March	25.27	84	3.0	369.5

Source: BSU, PAG-ASA Office, La Trinidad, Benguet

Table 2. The initial and final analysis of the soil

	pH	OM (%)	N (%)	P (ppm)	K (ppm)
Before planting	5.6	3.0	0.15	3500	259
After harvest	5.8	3.0	0.15	3200	292

Source: Department of Agriculture, Regional Field Unit 1, San Fernando City, La Union

Potassium (ppm). Potassium content of the soil increased after harvest from 259 to 292. The increase could be attributed to the application of compost in the area of the study. After many experiments, made by Krisma (2002), he concluded that the vital processes like photosynthesis and respiration are dependent on the potassium concentration in plant cells. He further stressed that this element activated several enzymes involved in the metabolism of carbohydrates.

Seedling Vigor and Uniformity of Seedlings

Table 3 shows the uniformity of seedlings and seedling vigor taken at 28 days after sowing inside the screen house. Among the seven progenies evaluated, TPS 10, TPS 11, TPS 12, TPS 15 and TPS 16 progenies were rated moderately uniform while progeny TPS 13 and TPS 14 were rated not uniform. The uniformity of seedling could be due to the different genotypic characteristics of the progenies. Seedling vigor among the progenies ranged from less vigorous to vigorous. TPS 15 was rated vigorous at the seedling stage. Progenies TPS 10, TPS 11, TPS 12 and TPS 16 were rated moderately vigorous. TPS 15 was rated vigorous while TPS 14 was less vigorous (Figure 2).

Table 3. Uniformity and seedling vigor of the seven potato progenies at 28 days after sowing

PROGENY	UNIFORMITY	SEEDLING VIGOR
TPS 10	Moderately uniform	Moderately vigorous
TPS 11	Moderately uniform	Moderately vigorous
TPS 12	Moderately uniform	Moderately vigorous
TPS 13	Not uniform	Less vigorous
TPS 14	Not uniform	Less vigorous
TPS 15	Moderately uniform	Vigorous
TPS 16	Moderately uniform	Moderately vigorous

Plant survival at 30, 45, 60 and 75 DAT

Table 4 shows the percentage of the plant survival of the different progenies at 30 to 75 days after transplanting (DAT). It was observed that there were no significant differences among the progenies. However, the highest percent survival was attained by progeny TPS 15 with a mean of 89 %, followed by TPS 16 with 88 % plant survival; the lowest percent survival was obtained by TPS 11 (76 %). The low percent survival among the different progenies might be due to the effect of transplanting and the non-adaptability of the progenies in the new environment.

Plant Vigor at 30, 45, 60 and 75 Days after Transplanting

The plant vigor of the different TPS progenies at 30, 45, 60 and 75 days after transplanting is shown in Table 4 and Figure 2. Plant vigor was based on the performance and growth stands of the different progenies. Significant differences were observed at 30, 45, and 60 DAT but not at 75 DAT. Progenies TPS 15 and TPS 16 were found to be vigorous at 30 DAT while TPS 10, TPS 12, TPS 13 and TPS 14 progenies were rated moderately vigorous while TPS 11 was found to be less vigorous. The poor vigor of the plants at this early stage of growth is due to transplanting. Furthermore, this could also be attributed by poor rooting characteristics in some of the progenies.

At 45 DAT, it was observed that most of the progenies have increased vigor except for TPS 11 and TPS 14. This implies that the plants have adapted to the new environment. Progenies TPS 15 and TPS 16 were rated highly vigorous at 60 DAT while the other progenies were observed to be moderately vigorous and vigorous.

A decrease in vigor at 75 DAT was noted in all the progenies. This could be attributed to the high rainfall that favors late blight infection during this stage of growth.

Table 4. Plant survival and plant vigor at 30, 45, 60 and 75 days after transplanting of the seven potato progenies grown for organic production

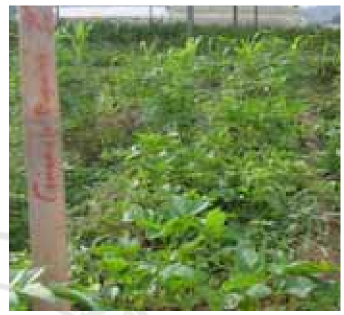
PROGENY	PLANT SURVIVAL (%)	PLANT VIGOR (DAT)			
		30	45	60	75
TPS 10	81	3[b]	4[a]	4[b]	3
TPS 11	76	2[c]	2[c]	3[c]	3
TPS 12	85	3[b]	4[a]	4[b]	3
TPS 13	86	3[b]	3[b]	4[b]	3
TPS 14	78	3[b]	2[c]	3[c]	2
TPS 15	89	4[a]	4[a]	5[a]	4
TPS 16	88	4[a]	4[a]	5[a]	4
CV (%)	8.46	9.70	15.80	8.00	10.85

Means followed by common letters are not significantly different at 5 % level of DMRT
Description: 1-Poor vigor; 2-Less vigor; 3-Moderately vigorous; 4-Vigorous; 5- Highly vigorous

TPS 12

TPS 16

TPS 15



TPS 10

TPS 13

TPS 11

TPS 14

Figure 2. Potato stands at 45 days after transplanting

Late Blight Infection

At 30 and 45 DAT, TPS 12, TPS 15 and TPS 16 progenies were rated highly resistant to late blight while the other progenies were rated resistant.

Increase in late blight infection among the progenies evaluated was observed at 75 DAT when all of the progenies become moderately resistant to late blight. The increase in the late blight incidence could be attributed to the high rainfall that occurred at 60 to 75 DAT.

Leaf Miner Incidence.

Leaf miner incidence is not observed in the area which could be due to the planting of marigold as insect repellant in the testing area.

Table 5. Late blight rating at 30, 45, 60, and 75 DAT of the seven progenies grown for organic production

PROGENY	LATE BLIGHT RATING (DAT)			
	30	45	60	75
TPS 10	2	2[a]	3	5
TPS 11	2	2[a]	2	5
TPS 12	1	1[b]	2	4
TPS 13	2	2[a]	2	4
TPS 14	2	2[a]	3	5
TPS 15	1	1[b]	2	4
TPS 16	1	1[b]	2	4
CV (%)	24.71	20.00	19.49	12.44

Means followed by common letters are not significantly different at 5 % level of DMRT
Description: 1-Highly resistant; 2-3-Resistant; 4-5-Moderately resistant; 6-7-Moderartely susceptible; 8-9-Susceptible.

Number and Weight of Marketable Tubers per 5 m^2

Table 6 and figure 3 shows the number and weight of marketable and non-marketable tubers per 5 m^2. No significant differences were observed on the number and weight of marketable tubers among the progenies. Results showed that the progeny which had the highest percent survival had the highest number and weight of marketable tubers. Numerically, TPS 15 progeny produced the most number (663) and heaviest weight (4,320 gms) of marketable tubers. It was also observed that the number of tubers does not necessarily revealed the highest weight of the tubers (Figure 3).

Nisperos (1982) reported that the yield of TPS progeny was comparable to the clones and cultivars. The TPS progeny out yielded seed tubers in terms of the number of tubers produced per plot, although, in terms of weight the yield of seed tubers was much greater than TPS progeny . This could be due to the smaller sizes of the tubers produced by TPS progeny.

Number and Weight of Non-marketable Tubers

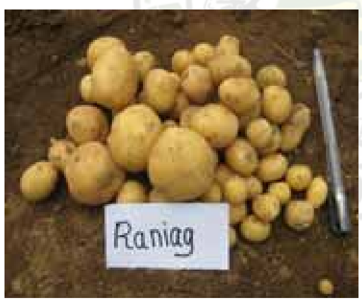
The progenies did not differ significantly on the number and weight of non-marketable tubers (Table 6). Although, numerically TPS 10 and TPS 14 produced the most number of non-marketable tubers with a mean of 11 while TPS 12 progeny produced the least (3). On the other hand, TPS 15 progeny gave the heaviest weight of non-marketable tubers of 50 grams. This is due to the cracking of tubers. Cracking in the tubers could be attributed to the insufficient amount of soil moisture during the reproductive stage of the plant.

TPS 12

TPS 14

TPS 16

TPS 10



TPS 13

TPS 11

TPS 15

Figure 3.Tubers of the of true potato seed progenies

Table 6. Number and weight of marketable, non-marketable and total yield of the seven potato progenies grown for organic production

PROGENY	MARKETABLE		NON-MARKETABLE		TOTAL YIELD per 5 m^2	
	Number	Weight (g)	Number	Weight (g)	Number	Weight (g)
TPS 10	337	860	11	30	348	890
TPS 11	334	1180	7	25	341	1205
TPS 12	332	1580	3	20	335	1870
TPS 13	440	1390	9	40	449	1430
TPS 14	182	360	11	40	193	400
TPS 15	663	4320	10	50	639	4380
TPS 16	340	1039	4	30	344	1609
CV (%)	13.89	20.48	22.18	24.14	13.55	20.34

Total Yield per Plot

The total number and weight of tubers produced per 5 m^2 is presented in Table 6. Number of tubers ranges from 193 to 639 while weight ranges from 400 to 4380 grams. Though no significant differences were observed among the progenies, TPS 15 progeny produced the highest yield.

Uniformity of Tubers

Table 7 and Figure 3 shows the uniformity of the tubers in terms of size, skin color, shape, depth of eyes and flesh color. Statistical analysis showed no significant differences observed among the progenies evaluated.

In terms of skin color, all of the progenies were observed to have a moderately uniform skin color except for TPS 12 which produced non-uniformity tuber color. According to Ratstovski (1981) both yellow and creamy white tubers are accepted for table and processing purposes.

Table 7. Tuber uniformity of the seven potato progenies grown for organic production

PROGENY	SIZE	SKIN COLOR	SHAPE	DEPTH OF EYES	FLESH COLOR
TPS 10	7	5	5	7	5
TPS 11	7	5	5	5	5
TPS 12	5	7	5	7	5
TPS 13	5	5	5	7	5
TPS 14	5	5	5	5	5
TPS 15	5	5	7	5	5
TPS 16	7	5	7	5	3
CV (%)	20.79	11.18	15.15	16.36	24.88

Description: 3-uniform; 5-moderately uniform; 7-not uniform

As to the shape, two progenies were rated not uniform (TPS 15 and TPS 16). The other progenies were observed to be moderately uniform. Shapes are oval, round oval and long oval.

With regards to the depth of eyes, TPS 11, TPS 14, TPS 15 and TPS 16 were rated moderately uniform while the other progenies were rated not uniform. Depth of eyes is important in processing because having shallower eyes for instance gave less trimming loss, shorter time in trimming, and higher volume of materials for chips (Sabiano, 2006).

As to the flesh color, progeny TPS 16 was rated uniform while the rest were rated moderately uniform.

Maturity of progenies

Significant differences were observed on the maturity among the seven progenies evaluated. TPS 15 and TPS 10 were the earliest to mature followed by TPS 12, TPS 13 and TPS 16 progenies of medium maturity. Progeny TPS 10 and TPS 14 were rated late maturing. Maturity of the progenies was based on the average tuber size at harvest.

Length of Stolons of Progenies

No significant differences were observed among the seven progenies evaluated (Table 8). However, TPS 10, TPS 12, TPS 14, TPS 15, and TPS 16 were observed to have short stolon while TPS 11 progeny have a medium length stolon. The length of stolon indicates the maturity of the potato, the longer the stolon, the later the maturity of the variety.

Number of Tubers per Hill

On the tuber set, no significant differences were observed among the potato progenies. Progeny TPS 15 with the highest percent survival, also produced more tubers per hill (7) while TPS 11, TPS 14 and TPS 16, produced the least number of tubers per hill.

Table 7. Maturity, length of stolons and tuber set of the seven progenies grown for organic production

PROGENY	MATURITY	LENGTH	NUMBER OF TUBERS / HILL
TPS 10	3[c]	3	5
TPS 11	7[a]	5	3
TPS 12	5[b]	3	5
TPS 13	5[b]	5	5
TPS 14	7[a]	3	3
TPS 15	3[b]	3	7
TPS 16	5[b]	3	3
CV (%)	19.22	24.99	25.13

Means followed by common letters are not significantly different at 5 % level of DMRT
Description: (maturity) 3-early, 5-medium, 7-late; (Length) 3-short, 5-medium, 7-long; (Tuber set) 3-few, 5-medium, 7- many

SUMMARY, CONCLUSION AND RECOMMENDATION

Summary

The seven progenies were evaluated for their performance both under screen house and field under organic production to determine the agronomic characters of the true potato seed progenies for organic production; identify the TPS progeny based on tuber qualities; and select the best tuber families with good yield and resistant to pests and diseases. The study was conducted at Benguet State University, Experimental Station, La Trinidad, Benguet.

True potato seeds collected were sown in a plastic tray, and after two weeks, the seedlings were rooted in banana pot lets in a sterilized media. These progenies were transplanted in the field one month after pricking.

In the field, mushroom compost was applied basally two weeks after transplanting. All necessary cultural management practices were done uniformly to all plots.

Results showed that TPS 10, TPS 11, TPS 12, TPS 15 and TPS 16 progenies had moderately uniform seedlings in screen house. In terms of seedling vigor, TPS 15 was the only progeny noted to be vigorous.

Based on the field performance, progeny TPS 15 produced the highest yield while TPS 14 had the lowest. Results showed that TPS 15 were highly vigorous at 60 days after transplanting and the highest percent survival.

In terms of late blight infection, TPS 12, TPS 15 and TPS 16 progenies were highly resistant at 30 and 45 days after transplanting however, at 75 days after

transplanting, all the potato progenies were moderately resistant to late blight. Leaf miner was not noted in the area.

As to the uniformity of the harvested progenies, variable differences were observed among the progenies in terms size, skin and flesh color, shape and depth of eyes. However, TPS 16 obtained the most uniform flesh color. On the other hand, there were highly significant differences among the seven progenies in term of earliness to mature

ty, TPS 15 and TPS 10 were both early maturing.

No significant differences noted on the length of stolon and tuber set (number of tubers per hill), however, TPS 15 produced the highest number of tuber set per hill.

Conclusion

Based on the results, TPS 15 is the most promising progeny having the highest percent survival, number and weight of marketable tubers per plot and vigor. The potato progeny is also maturing, has moderately uniform tuber characters, and is resistant to late blight under organic management.

Recommendation

All progenies evaluated are adapted under La Trinidad, Benguet condition. However, further evaluation of potato progenies should be conducted to determine their adaptability and stability in terms of yield, resistance to late blight and level of uniformity in farmer's field.

It is further recommended that the G_1 tubers produced from the study be used as planting materials.

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APPENDICES

Appendix Table 1. Percent plant survival at 30 days after transplanting

PROGENY	REPLICATION			TOTAL	MEAN
	I	II	III		
TPS 10	75	83	85	243	81
TPS 11	73	80	76	228	76
TPS 12	95	80	85	255	85
TPS 13	88	85	86	258	86
TPS 14	73	70	73	218	73
TPS 15	90	95	89	268	89
TPS 16	75	100	88	263	88
TOTAL	569	593	582	1733	83

ANALYSIS OF VARIANCE

SOURCE OF VARIATION	DEGREES OF FREEDOM	SUM OF SQUARES	MEAN SQUARE	COMPUTED F	TABULATED F	
					0.05	0.01
Block	2	50.667	25.333			
Treatment	6	699.238	116.540	2.39^{ns}	3.0	4.82
Error	12	585.333	48.778			
TOTAL	20	1335.238				

^{ns}= Not significant Coefficient of Variation (%) =8.46

Appendix Table 2. Plant vigor at days after transplanting

PROGENY	REPLICATION			TOTAL	MEAN
	I	II	III		
TPS 10	3	3	3	9	3
TPS 11	2	2	2	6	2
TPS 12	3	3	3	9	3
TPS 13	3	3	3	9	3
TPS 14	2	2	2	6	3
TPS 15	4	4	3	11	4
TPS 16	4	4	3	11	4
TOTAL	21	21	19	61	3

ANALYSIS OF VARIANCE

SOURCE OF VARIATION	DEGREES OF FREEDOM	SUM OF SQUARES	MEAN SQUARE	COMPUTED F	TABULATED F	
					0.05	0.01
Block	2	0.381	0.190			
Treatment	6	8.476	1.413	17.80**	3.0	4.82
Error	12	0.952	0.079			
TOTAL	20	9.810				

**= Highly significant   Coefficient of Variation (%) =9.70

Appendix Table 3. Plant vigor at 45 days after transplanting

PROGENY	REPLICATION			TOTAL	MEAN
	I	II	III		
TPS 10	4	3	3	11	4
TPS 11	2	3	2	7	2
TPS 12	4	4	3	11	4
TPS 13	3	3	3	9	3
TPS 14	2	2	2	6	2
TPS 15	5	5	3	13	4
TPS 16	4	4	4	12	4
TOTAL	24	24	20	69	3

ANALYSIS OF VARIANCE

SOURCE OF VARIATION	DEGREES OF FREEDOM	SUM OF SQUARES	MEAN SQUARE	COMPUTED F	TABULATED F	
					0.05	0.01
Block	2	1.524	0.762			
Treatment	6	13.143	2.190	8.36**	3.0	4.82
Error	12	3.143	0.262			
TOTAL	20	17.810				

**= Highly significant

Coefficient of Variation (%) = 15.80

Appendix Table 4. Plant vigor at 60 days after transplanting

PROGENY	REPLICATION			TOTAL	MEAN
	I	II	III		
TPS 10	4	4	4	12	4
TPS 11	3	3	3	9	3
TPS 12	4	4	4	12	4
TPS 13	4	4	3	11	4
TPS 14	3	3	3	9	3
TPS 15	5	5	4	14	5
TPS 16	5	5	4	14	5
TOTAL	28	28	25	81	4

ANALYSIS OF VARIANCE

SOURCE OF VARIATION	DEGREES OF FREEDOM	SUM OF SQUARES	MEAN SQUARE	COMPUTED F	TABULATED F	
					0.05	0.01
Block	2	0.857	0.429			
Treatment	6	8.571	1.429	15.0 **	3.0	4.82
Error	12	1.143	0.095			
TOTAL	20	10.571				

**= Highly significant Coefficient of Variation (%) = 8.00

Appendix Table 5. Plant vigor at 75 days after transplanting

PROGENY	REPLICATION			TOTAL	MEAN
	I	II	III		
TPS 10	4	3	3	10	3
TPS 11	3	3	3	9	3
TPS 12	4	3	3	10	3
TPS 13	4	3	3	10	3
TPS 14	3	3	3	9	3
TPS 15	4	4	3	11	4
TPS 16	4	4	3	11	4
TOTAL	26	23	21	70	3

ANALYSIS OF VARIANCE

SOURCE OF VARIATION	DEGREES OF FREEDOM	SUM OF SQUARES	MEAN SQUARE	COMPUTED F	TABULATED F	
					0.05	0.01
Block	2	1.143	0.571			
Treatment	6	1.619	0.270	2.12^{ns}	3.0	4.82
Error	12	1.524	0.127			
TOTAL	20	4.286				

^{ns}= Not significant

Coefficient of Variation (%) = 10.85

Appendix Table 6. Late blight at 30 days after transplanting

PROGENY	REPLICATION			TOTAL	MEAN
	I	II	III		
TPS 10	2	2	1	5	2
TPS 11	2	2	2	6	2
TPS 12	1	2	1	4	1
TPS 13	2	2	2	6	2
TPS 14	1	2	2	5	2
TPS 15	1	1	1	3	1
TPS 16	1	2	1	4	1
TOTAL	10	13	10	33	2

ANALYSIS OF VARIANCE

SOURCE OF VARIATION	DEGREES OF FREEDOM	SUM OF SQUARES	MEAN SQUARE	COMPUTED F	TABULATED F	
					0.05	0.01
Block	2	0.857	0.429			
Treatment	6	2.467	0.413	2.74^{ns}	3.0	4.82
Error	12	1.810	0.151			
TOTAL	20	5.143				

^{ns}= Not significant

Coefficient of Variation (%) = 24.17

Appendix Table 7. Late blight at 45 days after transplanting

PROGENY	REPLICATION			TOTAL	MEAN
	I	II	III		
TPS 10	2	2	1	5	2[a]
TPS 11	2	2	2	6	2[a]
TPS 12	1	2	1	4	1[b]
TPS 13	2	2	2	6	2[a]
TPS 14	2	2	2	6	2[a]
TPS 15	1	1	1	3	1[b]
TPS 16	1	2	1	4	1[b]
TOTAL	11	13	10	34	2[a]

ANALYSIS OF VARIANCE

SOURCE OF VARIATION	DEGREES OF FREEDOM	SUM OF SQUARES	MEAN SQUARE	COMPUTED F	TABULATED F	
					0.05	0.01
Block	2	0.667	0.333			
Treatment	6	2.667	0.444	4.0*	3.0	4.82
Error	12	1.333	0.111			
TOTAL	20	4.667				

* = Significant Coefficient of Variation (%) = 20.00

Appendix Table 8. Late blight at 60 days after transplanting

PROGENY	REPLICATION			TOTAL	MEAN
	I	II	III		
TPS 10	3	2	3	8	3
TPS 11	2	3	2	7	2
TPS 12	2	2	2	6	2
TPS 13	2	2	2	6	2
TPS 14	3	3	2	8	3
TPS 15	2	2	2	6	2
TPS 16	3	2	2	7	2
TOTAL	17	14	15	48	2

ANALYSIS OF VARIANCE

SOURCE OF VARIATION	DEGREES OF FREEDOM	SUM OF SQUARES	MEAN SQUARE	COMPUTED F	TABULATED F	
					0.05	0.01
Block	2	0.286	0.143			
Treatment	6	1.619	0.270	1.36^{ns}	3.0	4.82
Error	12	2.381	0.198			
TOTAL	20	4.286				

^{ns}= Not significant

Coefficient of Variation (%) = 11.36

Appendix Table 9. Late blight at 75 days after transplanting

PROGENY	REPLICATION			TOTAL	MEAN
	I	II	III		
TPS 10	5	5	4	14	5
TPS 11	6	4	4	14	5
TPS 12	5	4	3	12	4
TPS 13	5	5	3	13	4
TPS 14	6	5	3	14	5
TPS 15	4	4	3	11	4
TPS 16	4	4	3	11	4
TOTAL	35	31	23	89	4

ANALYSIS OF VARIANCE

SOURCE OF VARIATION	DEGREES OF FREEDOM	SUM OF SQUARES	MEAN SQUARE	COMPUTED F	TABULATED F	
					0.05	0.01
Block	2	10.667	5.333			
Treatment	6	3.810	0.635	2.29^{ns}	3.0	4.82
Error	12	3.333	0.278			
TOTAL	20	17.810				

^{ns}= Not significant   Coefficient of Variation (%) = 12.44

Appendix Table 10. Number of marketable tubers

PROGENY	REPLICATION			TOTAL	MEAN
	I	II	III		
TPS 10	109	48	180	337	112
TPS 11	50	127	157	334	111
TPS 12	165	130	37	332	111
TPS 13	131	130	179	440	147
TPS 14	47	26	109	182	61
TPS 15	290	253	120	663	221
TPS 16	182	102	56	340	113
TOTAL	974	816	838	2628	125

ANALYSIS OF VARIANCE

SOURCE OF VARIATION	DEGREES OF FREEDOM	SUM OF SQUARES	MEAN SQUARE	COMPUTED F	TABULATED F	
					0.05	0.01
Block	2	2092.571	1046.286			
Treatment	6	43538.571	7256.429	1.71^{ns}	3.0	4.82
Error	12	50891.429	4240.952			
TOTAL	20	96522.571				

^{ns}= Not significant

Coefficient of Variation (%) = 13.89

Appendix Table 11. Weight of marketable tubers (gms)

PROGENY	REPLICATION			TOTAL	MEAN
	I	II	III		
TPS 10	520	160	180	860	287
TPS 11	90	290	800	1180	393
TPS 12	930	610	40	1580	527
TPS 13	290	400	700	1390	463
TPS 14	60	20	280	360	120
TPS 15	1610	2390	320	4320	1440
TPS 16	620	309	110	1039	346
TOTAL	4120	4179	2430	10729	511

ANALYSIS OF VARIANCE

SOURCE OF VARIATION	DEGREES OF FREEDOM	SUM OF SQUARES	MEAN SQUARE	COMPUTED F	TABULATED F	
					0.05	0.01
Block	2	281837.238	140918.619			
Treatment	6	3329176.476	554862.746	2.28^{ns}	3.0	4.82
Error	12	2921770.095	243480.841			
TOTAL	20	6532783.810				

^{ns}= Not significant

Coefficient of Variation (%) = 20.48

Appendix Table 12. Number of non-marketable tubers

PROGENY	REPLICATION			TOTAL	MEAN
	I	II	III		
TPS 10	8	2	1	11	4
TPS 11	1	3	3	7	2
TPS 12	2	1	0	3	1
TPS 13	4	2	3	9	3
TPS 14	2	0	9	11	4
TPS 15	5	4	1	10	3
TPS 16	2	2	0	4	1
TOTAL	24	14	17	55	3

ANALYSIS OF VARIANCE

SOURCE OF VARIATION	DEGREES OF FREEDOM	SUM OF SQUARES	MEAN SQUARE	COMPUTED F	TABULATED F	
					0.05	0.01
Block	2	7.524	30762			
Treatment	6	21.619	3.603	0.52^{ns}	3.0	4.82
Error	12	83.810	6.984			
TOTAL	20	112.952				

^{ns}= Not significant

Coefficient of Variation (%) = 22.18

Appendix Table 13. Weight of non-marketable tubers (gms)

PROGENY	REPLICATION			TOTAL	MEAN
	I	II	III		
TPS 10	10	10	10	30	10
TPS 11	10	10	5	25	8
TPS 12	10	10	0	20	7
TPS 13	10	10	20	40	13
TPS 14	10	0	30	40	13
TPS 15	10	30	10	50	17
TPS 16	20	10	0	30	10
TOTAL	80	80	75	235	11

ANALYSIS OF VARIANCE

SOURCE OF VARIATION	DEGREES OF FREEDOM	SUM OF SQUARES	MEAN SQUARE	COMPUTED F	TABULATED F	
					0.05	0.01
Block	2	2.381	1.190			
Treatment	6	211.905	35.317	0.39^{ns}	3.0	4.82
Error	12	1080.952	90.079			
TOTAL	20	1295.238				

^{ns}= Not Significant

Coefficient of Variation (%) =24.14

Appendix Table 14. Total number of tubers per plot

PROGENY	REPLICATION			TOTAL	MEAN
	I	II	III		
TPS 10	117	50	181	348	116
TPS 11	51	130	160	341	114
TPS 12	167	131	37	335	112
TPS 13	135	132	182	449	150
TPS 14	49	253	118	420	140
TPS 15	295	257	121	693	224
TPS 16	184	104	56	344	115
TOTAL	998	1057	855	2930	139

ANALYSIS OF VARIANCE

SOURCE OF VARIATION	DEGREES OF FREEDOM	SUM OF SQUARES	MEAN SQUARE	COMPUTED F	TABULATED F	
					0.05	0.01
Block	2	3082.571	1541.286			
Treatment	6	29715.810	49.635	0.86^{ns}	3.0	4.82
Error	12	69058.762	5754.894			
TOTAL	20	101857.143				

^{ns}= Not Significant

Coefficient of Variation (%) =13.55

Appendix Table 15. Total weight of tubers per plot (g)

PROGENY	REPLICATION			TOTAL	MEAN
	I	II	III		
TPS 10	530	170	190	890	296.67
TPS 11	100	300	805	1205	401.67
TPS 12	940	620	40	1870	623.33
TPS 13	300	410	720	1430	476.67
TPS 14	70	20	310	400	133.33
TPS 15	1620	2430	330	4380	1460.00
TPS 16	640	319	110	1069	356.33
TOTAL	4200	4269	2505	11244	535

ANALYSIS OF VARIANCE

SOURCE OF VARIATION	DEGREES OF FREEDOM	SUM OF SQUARES	MEAN SQUARE	COMPUTED F	TABULATED F	
					0.05	0.01
Block	2	285213.429	142606.714			
Treatment	6	3377363.143	562893.857	2.25^{ns}	3.0	4.82
Error	12	3005810.571	250484.214			
TOTAL	20	6668387.143				

^{ns}= Not Significant Coefficient of Variation (%) = 20.34

Appendix Table 16. Maturity of progenies

PROGENY	REPLICATION			TOTAL	MEAN
	I	II	III		
TPS 10	4	3	4	11	4[a]
TPS 11	3	2	2	7	2[c]
TPS 12	4	3	3	10	3[b]
TPS 13	3	3	3	9	3[b]
TPS 14	2	2	2	6	2[c]
TPS 15	4	4	3	11	4[a]
TPS 16	3	4	3	10	3[b]
TOTAL	23	21	20	64	3

ANALYSIS OF VARIANCE

SOURCE OF VARIATION	DEGREES OF FREEDOM	SUM OF SQUARES	MEAN SQUARE	COMPUTED F	TABULATED F	
					0.05	0.01
Block	2	0.667	0.333			
Treatment	6	7.619	1.270	5.71**	3.0	4.82
Error	12	2.667	0.222			
TOTAL	20	10.952				

**= Highly Significant

Coefficient of Variation (%) = 15.47

Appendix Table 17. Length of stolon

PROGENY	REPLICATION			TOTAL	MEAN
	I	II	III		
TPS 10	3	3	3	9	3
TPS 11	5	5	3	11	5
TPS 12	3	3	3	9	3
TPS 13	5	5	3	13	5
TPS 14	3	3	3	9	3
TPS 15	3	3	3	9	3
TPS 16	3	3	5	11	3
TOTAL	25	25	23	71	4

ANALYSIS OF VARIANCE

SOURCE OF VARIATION	DEGREES OF FREEDOM	SUM OF SQUARES	MEAN SQUARE	COMPUTED F	TABULATED F	
					0.05	0.01
Block	2	0.697	0.349			
Treatment	6	7.160	1.193	1.62^{ns}	3.0	4.82
Error	12	8.835	0.736			
TOTAL	20	8.835				

^{ns}= Not Significant

Coefficient of Variation (%) = 24.99

Appendix table 18. Tuber set (number of tubers per hill)

PROGENY	REPLICATION			TOTAL	MEAN
	I	II	III		
TPS 10	5	3	5	13	5
TPS 11	3	3	5	11	3
TPS 12	5	5	3	13	5
TPS 13	5	5	5	13	5
TPS 14	3	3	5	11	3
TPS 15	7	7	5	19	7
TPS 16	5	3	3	11	3
TOTAL	33	29	31	91	4

ANALYSIS OF VARIANCE

SOURCE OF VARIATION	DEGREES OF FREEDOM	SUM OF SQUARES	MEAN SQUARE	COMPUTED F	TABULATED F	
					0.05	0.01
Block	2	1.143	0.571			
Treatment	6	17.143	2.857	2.31^{ns}	3.0	4.82
Error	12	14.857	1.238			
TOTAL	20	33.143				

^{ns}= Not Significant

Coefficient of Variation (%) = 19.22

Appendix table 19. Uniformity of tuber size

PROGENY	REPLICATION			TOTAL	MEAN
	I	II	III		
TPS 10	7	7	5	19	7
TPS 11	7	5	7	19	7
TPS 12	7	5	5	17	5
TPS 13	7	5	5	17	5
TPS 14	5	5	5	15	5
TPS 15	5	5	7	7	5
TPS 16	5	7	7	19	7
TOTAL	43	39	41	123	6

ANALYSIS OF VARIANCE

SOURCE OF VARIATION	DEGREES OF FREEDOM	SUM OF SQUARES	MEAN SQUARE	COMPUTED F	TABULATED F	
					0.05	0.01
Block	2	0.937	0.469			
Treatment	6	5.235	0.872	0.60^{ns}	3.0	4.82
Error	12	17.384	1.449			
TOTAL	20	23.557				

^{ns}= Not significant

Coefficient of Variation (%) =20.79

Appendix table 20. Uniformity of tuber skin color

PROGENY	REPLICATION			TOTAL	MEAN
	I	II	III		
TPS 10	5	5	7	17	5
TPS 11	5	5	5	15	5
TPS 12	7	5	7	19	7
TPS 13	5	5	5	15	5
TPS 14	5	5	5	15	5
TPS 15	5	5	5	15	5
TPS 16	5	5	5	15	5
TOTAL	37	35	39	111	5

ANALYSIS OF VARIANCE

SOURCE OF VARIATION	DEGREES OF FREEDOM	SUM OF SQUARES	MEAN SQUARE	COMPUTED F	TABULATED F	
					0.05	0.01
Block	2	1.143	0.571			
Treatment	6	40952	0.825	2036^{ns}	3.0	4.82
Error	12	40190	0.349			
TOTAL	20	10.286				

^{ns}= Not significant

Coefficient of Variation (%) =11.18

Appendix table 21.Uniformity of tuber shape

PROGENY	REPLICATION			TOTAL	MEAN
	I	II	III		
TPS 10	5	5	7	17	5
TPS 11	5	5	5	15	5
TPS 12	5	5	5	15	5
TPS 13	5	5	7	17	5
TPS 14	5	7	5	17	5
TPS 15	7	5	7	19	7
TPS 16	7	7	7	21	7
TOTAL	39	39	43	121	6

ANALYSIS OF VARIANCE

SOURCE OF VARIATION	DEGREES OF FREEDOM	SUM OF SQUARES	MEAN SQUARE	COMPUTED F	TABULATED F	
					0.05	0.01
Block	2	1.524	0.762			
Treatment	6	9.143	1.524	2.0^{ns}	3.0	4.82
Error	12	9.143	0.762			
TOTAL	20	19.810				

^{ns}= Not significant

Coefficient of Variation (%) =15.15

Appendix table 22.Depth of eyes uniformity

PROGENY	REPLICATION			TOTAL	MEAN
	I	II	III		
TPS 10	5	7	7	19	7
TPS 11	5	5	5	15	5
TPS 12	7	5	7	19	7
TPS 13	7	7	7	21	7
TPS 14	5	3	5	13	5
TPS 15	7	5	5	17	5
TPS 16	5	5	7	17	5
TOTAL	41	37	43	121	6

ANALYSIS OF VARIANCE

SOURCE OF VARIATION	DEGREES OF FREEDOM	SUM OF SQUARES	MEAN SQUARE	COMPUTED F	TABULATED F	
					0.05	0.01
Block	2	2.667	1.333			
Treatment	6	14. 476	2.413	2.71^{ns}	3.0	4.82
Error	12	10.667	0.889			
TOTAL	20	27.810				

^{ns}= Not significant Coefficient of Variation (%) =16.36

Appendix table 23. Uniformity of tuber flesh color.

PROGENY	REPLICATION			TOTAL	MEAN
	I	II	III		
TPS 10	3	5	5	13	5
TPS 11	3	5	5	13	5
TPS 12	5	5	5	15	5
TPS 13	5	5	3	13	5
TPS 14	5	3	5	13	5
TPS 15	5	5	5	15	5
TPS 16	3	3	5	11	3
TOTAL	29	31	33	93	5

ANALYSIS OF VARIANCE

SOURCE OF VARIATION	DEGREES OF FREEDOM	SUM OF SQUARES	MEAN SQUARE	COMPUTED F	TABULATED F	
					0.05	0.01
Block	2	1.343	0.671			
Treatment	6	5.074	0.846	0.71^{ns}	3.0	4.82
Error	12	14.223	1.185			
TOTAL	20	20.640				

ns = Not significant

Coefficient of Variation (%) =24.88