BIBLIOGRAPHY

GATAWA, FREDA D.APRIL 2008. Evaluation of different potato entries using stems cuttings Under Sagpat, Kibungan, Benguet Condition .Benguet State University, La Trinidad, Benguet.

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ABSTRACT

The study was conducted to evaluate potato entries grown from rooted stem cuttings and to identify the highest yielding entries that are adapted at Sagpat, Kibungan, Benguet Condition.

The ten potato entries evaluated significantly differed in plant survival, plant height and weight of marketable tubers. Entry 13.1.1 produced the tallest plants as compared to the other entries. Ganza had the highest weight of marketable tubers followed by Solibao, 96-06, 2.21.6.2, and 13.1.1. Ganza gained the highest profit while the Granola had the least profit.

Ganza, Solibao, 96-06, 21.6.2, and 13.1.1 grown from rooted cuttings are favorable in Sagpat, Kibungan Conditions. However, to attain optimum yield, favorable conditions for potato production should exist.

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INTRODUCTION

Potato (*Solanum tuberusum*) plays an important role in our economy. It also provides food. It is in fact a crop of high potential and is widely grown in the Cordilleras particularly in the Benguet and Mountain Province since it is one of the profitable crops to grow. It remains to be a high value crop because of its local and export potential and growing market demands (Technoguide 2005). Potato is basically utilized as food. It contains high nutrition values, good sources of carbohydrates, proteins, minerals, vitamins and calcium. It is grown in our locality due to its favorable climatic condition and soil type which are the primary factors favoring the growth and development of the crop leading to good production yield (Smith, 1977).

At present, the demand of potatoes continues to increase. Rapid urbanization and the emerging importance of potato processing will generate additional demands. This is to maintain and raise the number of fast food chains and the snacks industry that requires high supply of potato. Thus, selection of adaptable potato cultivars and healthy planting materials become critical (FRLD, 1985).

In some cases, losses are incurred because of seed borne-diseases affecting potato. Selection of appropriate cultivars, high yielding variety and adaptable to the locality should be done. Proper selection of planting materials is still the most important in successful potato production, for increasing productivity and sustainability. Seed tubers are also costly on the part of the farmers and prone to seed borne diseases and this can reduce the yield (Gayao *et al*., 1985).

To be able to cope with the problem on planting materials, alternative planting materials should be used. The most economic planting materials is the rooted stem

cutting. The importance of stem cutting is the increase of new cultivars and may prevent the occurrence of tuber borne diseases. (Escobar and Vander Zaag, 1985).

According to *Gayao et al*., (1987), rooted stem cutting can reduce the production cost for as low as 60%. Stem cutting is a rapid multiplication technique (RMT) for production of potato planting materials.. The primary step is to keep the highland farmers to increase potato production through the use of stem cuttings thereby increasing their production income.

The study was conducted to evaluate the different potato entries grown from rooted stem cuttings and to identify the highest yielding entries that is adapted to Sagpat, Kibungan, Benguet Condition.

The study was conducted at Sagpat, Kibungan, Benguet from October 2007 to January 2008.

REVIEW OF LITERATURE

Varietal Evaluation of Potato Varieties

Varietal Evaluation is important in order to observe performance characteristics such as yield, early growth, vigor, maturity and keeping quality. Different varieties have a wide range of differences like plant size and yield performance. However, the varieties to be selected should be high yielding, insect and disease resistant and early maturing (HARRDEC, 1995).

Rasco and Amante (1994) reported that varietal evaluation is ultimately measured in terms of the variety that passed the evaluation process by the end users. Varietal trial can be done by assessing available plants traits that are perceived to be related to the evaluation objectives.

Evaluation is a continuing activity in the Philippines highland to select a variety that is both high yielding and resistant. Evaluation and screening of wide range of germplasm continue in the highlands to identify and select cultivars that are adapted, high yielding, and resistant. Thus, farmers in highland still need cultivars resistant to disease, adapted, and are high yielding (Baldo *et al*, 1990).

Bautista and Mabessa (1986), stated that selecting right variety will minimize problems associated with water and fertilizer management. Growing the wrong variety may mean crop failure because of disease infestation. Variety to be selected should be with high yielding ability, regional and adaptability resistance to diseases and pests and quality.

Use of Stem Cuttings in Potato Production

Clean seed is the most important factor in obtaining high yield in potato production. Demonteverde (1991) stated that the alternative planting materials to tuber seed is the stem cuttings. Stem cuttings can be rapidly multiplied and this technique could be adapted by small farmers in both cool and warm climate. Apical cuttings are promising tool for germplasm evaluation. Potato is traditionally grown from tuber seed. Tuber seed can account for 50% cost of production. The alternative is to grow potato from cuttings. Cuttings can be rapidly multiplied, and can be used for seed production or directly for potato production.

Escobar and Vander Zaag (1985) found that stem cuttings was a source of clean planting materials. These materials are disease free. The cost of planting materials is also reduced however, labor requirements are increased.

In potato production using stem cuttings, high mortality rate is one of the main problems of the farmers that makes them lazy to use as their alternative planting materials. However, using rooted cutting is reported to be cheaper than seed tubers (Gayao *et al.,* (1987).

Dalang *et al*., (1990) further stated that stem cuttings as a Rapid Multiplication Technique (RMT) for potato, yields more planting materials than the traditional method which is the use of seed tubers. Rooted stem cuttings are ready for transplanting after 9 to 15 days from cuttings as compared to seed tubers that take 4 to 8 months dormancy.

Rooted stem cuttings are free from diseases because it can be obtained from pest and disease free mother plants of planting tubers, and also serve as low cost planting materials.

MATERIALS AND METHOD

An area of 150 m^2 was properly prepared before planting. The area was divided into 3 blocks. Each block composed ten plots measuring 1m x 5m and each plot was planted with one potato entry using stem cuttings.

Ten potato entries of rooted stem cuttings were acquired from the Northern Philippine Root Crops and Research and Training Center (NPRCRTC). The different treatments were equally applied with a handful of chicken manure per hill together with ½ of the recommended rate of inorganic fertilizer 140-140-140 kg N-P_2O_5-K_2O/ha was applied as basal five days prior to planting. The remaining ½ of the recommended inorganic fertilizer was applied as sidedress during hilling-up 30 days after transplanting. The potato stem cuttings were planted at the distance of 25cm × 30cm in between hills and rows. The experiment was laid out following the Randomized Complete Block Design (RCBD).

The treatments were as follows:

Treatment	Entry	Source/agency
T_1	13.1.1	CIP
T_2	96.06	CIP
T_3	573275	CIP
T_4	676070	CIP
T_5	2.21.6.2	Philippines
T_6	MLUSA-3	Mainland USA
T_7	Ganza	CIP

T_8	Solibao	CIP
T_9	Granola(Check)	Germany
T_{10}	Igorota(Check)	Philippines

Cultural management such as hilling-up, irrigation, weeding and spraying of insecticides and fungicides were done as preventive measure against pest and diseases of plants.

All treatments were harvested at the same time at maturity at 90 days from planting.

The data gathered were:

1. Percentage Survival (%). The plants that survived 30 DAT were taken using the formula:

$$\% \text{ Survival} = \frac{\text{Number of plants survived}}{\text{Total number of plants planted}} \times 100$$

2. Plant Vigor. This was taken one month DAT using the following rating scale 1-5 by (Palomar and Sanico, 1994).

Rating	Description
1	Very poor
3	Moderately vigorous
5	Highly vigorous

3. Initial plant height (cm). Initial plant height was measured 30 DAT from the base to the tip of the longest shoots of ten random sample plants.

4. Final plant height (cm). Final height of the plant was measured at maturity from the base to the tip of the longest shoot of ten sample plants that was taken at random.

5. Late blight incidence. This was observed and recorded 30,45, and 60 DAT, using the CIP Scale (Henfling, 1987).

CIP scale value	Blight (%)		Symptoms
	Mean	limits	
1	0		No late blight observable
2	2.5	Traces -< 5	Late blight present. Maximum 10 lesions per plant
3	10	5 -< 15	Plants look healthy, but lesions are easily seen at closer distance. Maximum foliage area affected by lesions or destroyed corresponds to no more than 20 leaflets.
4	25	15 -< 35	Late blight easily seen on most plants. About 25% of foliages is covered with lesions or destroyed.
5	50	35 -< 65	Plot looks green however, all plants are affected. Lower leaves are dead. About half the foliage area is destroyed.
6	75	65 -< 85	Plots look green with brown flecks. About 75% of each plant is affected. Leaves of the lower half of plants are destroyed.
7	90	85 -< 95	Plot neither predominantly green nor brown. Only top leaves are green. Many stems have large lesions.
8	97.5	95 -< 100	Plot is brown-colored. A few top leaves still have some green areas. Most stems have lesions or are dead.
9	100		All leaves and stems are dead.

The description of symptoms is based on plants with 4 stems and 10 to 12 leaves per stem.

6. Number and weight of marketable tubers/plot (kg). All tubers that are marketable size, not malformed, free from cuts, cracks and with out more than 10% greening of the total surface are counted and weighed at harvest.

7. Number and weight of non-marketable tubers/plot (kg). These were the tubers that were malformed, damaged by pest and disease, and those with more than 10% greening.

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

9. Computed yield (tons/ha). This was computed in hectare basis using the formula:

$$\text{Yield (tons/ha)} = \frac{\text{Total yield/plot}}{\text{Plot size } (m^2)} \times 10,000$$

10. Return of Cash on Expense (ROCE). This was computed by dividing the net profit over the total cost of production multiplied by 100.

$$\text{ROCE} = \frac{\text{Net profit}}{\text{Total cost of production}} \times 100$$

11. Dry matter content (DMC). Tubers were weighed into fifty grams per sample. Sliced into cubes, and oven dried at 80 ^{o}C for 48 hours. This was recorded and computed using the following formula:

$$\text{\% Moisture Content (MC)} = \frac{\text{Fresh weight – Over dry weight}}{\text{Fresh Weight}} \times 100$$

% Dry matter content (DMC) = 100% - %MC

Analysis of data

All quantitative data was analyzed through analysis of variance (ANOVA) for randomized complete block design (RCBD) with three replication. Significance of difference among the treatment means was tested using the Duncan's Multiple Range Test (DMRT).

RESULTS AND DISCUSSION

Percent Survival

Table 1 shows the percentage survival of the ten potato entries grown from rooted stem cuttings. Ganza, Solibao, 676070, 13.1.1, 2.21.6.2 and 96-06, obtained the highest percentage of survival followed by Igorota and 573275. While Granola and MLUSA-3 obtained the lowest survival.

Table 1. Percentage survival of ten potato entries grown from rooted stem cuttings.

ENTRY	SURVIVAL (%)
13.1.1	98[a]
96-06	98[a]
573275	89[b]
676070	100[a]
2.21.6.2	98[a]
MLUSA-3	80[c]
Ganza	100[a]
Solibao	100a
Granola (check)	76[c]
Igorota (check)	88[b]
CV (%)	4.41

*Means with the same letter are not significantly different at 5% level by DMRT

Plant vigor

Table 2 shows the plant vigor of the different entries evaluated at 30 and 45 days after planting.

At 30 and 45 days after planting, all the entries were rated vigorous except MLUSA-3 which was rated less vigorous at 45 DAP and this could be due to the genetic Characteristics of this entry aside from the change of temperature and photo-period.

Table 2. Plant vigor of ten potato entries grown from rooted stem cuttings at 30 and 45 DAT.

ENTRY	PLANT VIGOR DAYS AFTER PLANTING	
	30	45
13.1.1	3	3
96-06	3	3
573275	3	3
2.21.6.2	3	3
676070	3	3
MLUSA-3	3	2
Ganza	3	3
Solibao	3	3
Granola (check)	3	3
Igorota (check)	3	3

Rating Scale: 1 – very poor; 2 – less vigorous; 3 – vigorous; 4 – moderately vigorous; 5 – highly vigorous

Late Blight Incidence

As indicated in the ratings, entries 13.1.1, 96-06, 573275, 2.21.6.2, Ganza and Igorota were all highly resistant to late blight 45 days after planting and the rest were rated resistant (Table 3). Then at 60 days after planting, entries 96-06, 2.21.6.2, MLUSA-3 and Ganza were still highly resistant to late blight and the rest were resistant. This highly resistant from 45 and 60 days after planting was attributed to the minimal use of fungicide and also to the genetic make up of the crops.

Table 3. Late blight incidence of ten potato entries grown from rooted stem cuttings at 45 and 60 DAT.

ENTRY	LATE BLIGHT RATING DAYS AFTER PLANTING	
	45	60
13.1.1	1	2
96-06	1	1
573275	1	2
676070	2	2
2.21.6.2	1	1
MLUSA-3	2	1
Ganza	1	1
Solibao	2	2
Granola (check)	2	2
Igorota (check)	1	2

Rating Scale: 1 –highly resistant; 2 – 3 – resistant; 4 – 5 – moderately resistant
6 – 7 - moderately susceptible; 8 – 9 – susceptible

Initial and final plant height

Results showed that the plant height of the different entries significantly varies (Table 4). Entry 13.1.1 significantly had the tallest plants for the recorded initial and final height followed by Solibao for the initial and final height measured. The shortest plants were from Ganza and Granola for the initial and final height, respectively. The significant differences on the plant initial and final height of the different entries could be due to their genetic characteristics and also the photoperiods.

Table 4. Initial and final height (cm) of ten potato entries grown from rooted stem cuttings.

ENTRY	INITIAL HEIGHT (cm)	FINAL HEIGHT (cm)
13.1.1	15.51[a]	30.17[a]
96-06	12.30[bcd]	22.36[d]
573275	10.19[e]	20.90[e]
676070	12.35[c]	20.65[e]
2.21.6.2	10.17[e]	23.02[cd]
MLUSA-3	13.09[bc]	23.65[c]
Ganza	5.38[f]	16.60[g]
Solibao	13.21[b]	28.45[b]
Granola (check)	11.68[d]	19.06[f]
Igorota (check)	11.22[dc]	20.92[e]
CV (%)	7.07	1.86

*Means with the same letter are not significantly different at 5% level by DMRT

Number and weight of Marketable Tubers
From the ten Potato Entries Grown from Stem Cuttings

On the tuber number, significant differences were noted among the entries evaluated (Table 5).Entries 13.1.1 and 2.21.6.2 had the most numbers of marketable tubers followed by Ganza and the least was Granola. For the weight, Ganza had the heaviest followed by entries 96-06, Solibao, 2.21.6.2, 13.1.1, Igorota and 676070.The least for the marketable weight was realized from Granola with the weight of 0.26 kilo/5m^2. This yield weight differences was considered as the effect of the tuber size differences.

Table 5. Number and weight (kg) of marketable tubers from ten potato entries grown from rooted stem cuttings.

ENTRY	MARKETABLE TUBERS (kg/ 5m^2)	
	NUMBER	WEIGHT
13.1.1	139^{a}	3.17^{b}
96-06	110^{c}	3.75^{ab}
573275	49^{g}	1.93^{c}
676070	117^{bc}	3.025^{b}
2.21.6.2	129a	3.42^{b}
MLUSA-3	94^{e}	2.65^{bc}
Ganza	120^{b}	4.76^{a}
Solibao	105^{d}	3.78^{ab}
Granola (check)	15^{j}	0.26^{d}
Igorota (check)	91^{f}	3.13^{b}
CV (%)	26.29	20.41

*Means with the same letter are not significantly different at 5% level by DMRT

Number and Weight of Non-marketable tubers
From the ten Potato Entries Grown from Stem Cuttings

Table 6 shows the number and weight of non-marketable tubers. Entries MLUSA-3 and 13.1.1 consistently produced the highest number and weight of non-marketable tubers out of ten potato entries evaluated. The lightest was noted from the check variety (Granola).

Table6. Number and weight (kg) of non-marketable tubers from ten potato entries Grown from rooted stem cuttings.

ENTRY	NON-MARKETABLE TUBERS ($kg/5m^2$)	
	NUMBER	WEIGHT
13.1.1	113^{a}	0.8^{a}
96-06	32^{b}	0.35^{bc}
573275	58^{b}	0.425^{bc}
676070	51^{b}	0.45^{bc}
2.21.6.2	102^{a}	0.61^{ab}
MLUSA-3	135^{a}	0.9^{a}
Ganza	55^{b}	0.59^{ab}
Solibao	61^{b}	0.63^{b}
Granola (check)	50^{b}	0.22^{c}
Igorota (check)	42^{b}	0.45^{bc}
CV (%)	21.58	23.02

*Means with the same letter are not significantly different at 5% level by DMRT

Total yield and computed yield

Significant difference among the potato entries were observed on the total and computed yield (Table 7). Ganza produced the heaviest total yield with 5.08 kg/5m^{2}and computed yield of 10.16 tons/ha. Nevertheless Solibao, 2.21.6.2, 96-06, and 13.1.1 were significantly comparable with Ganza. Thereby, these entries being the highest yielder were suited to the area.

The low yield produced by the other entries could be due to their non-suitability or the unfavorable conditions during the conduct of the study.

Table 7. Total and computed yield of ten potato entries grown from rooted stem cuttings.

ENTRY	TOTAL YIELD (kg/5m^2)	COMPUTEDYIELD (tons/ha)
13.1.1	3.97^{ab}	7.93^{ab}
96-06	4.1^{ab}	8.20^{ab}
573275	2.35^{c}	4.70^{c}
676070	3.44^{bc}	6.87^{b}
2.21.6.2	4.03^{ab}	8.06^{ab}
MLUSA-3	3.48^{bc}	6.97^{b}
Ganza	5.08^{a}	10.16^{a}
Solibao	4.92^{ab}	8.83^{ab}
Granola (check)	0.47^{d}	0.93^{d}
Igorota (check)	3.58^{b}	7.17^{b}
CV (%)	18.59	18.38

*Means with the same letter are not significantly different at 5% level by DMRT

Figure 1. Yield of the nine potato entries.

Return on Cash Expense

Cash expense of potato entries is shown in (Table 8). Ganza had the highest ROCE with 56.24% followed by Solibao, entries 96-06, and 2.21.6.2 with their ROCE of 24.27, 23.18 and 12.23 respectively. These results indicate that the entries with the highest yield also gained the highest profit.

Table 8. Return on cash expense of ten potato entries grown from rooted stem cuttings

ENTRY	COST OF PRODUC-TION (Php)	MARKETABLE TUBERS ($kg/5m^2$)	GROSS SALE (Php)	NET INCOME (Php)	ROCE
13.1.1	274	9.5	85.00	11.00	4.01
96-06	274	11.25	337.50	63.50	23.18
573275	274	5.78	173.40	-100.6	-37.46
676070	274	9.18	275.40	1.40	0.51
2.21.6.2	274	10.25	307.50	33.50	12.23
MLUSA-3	274	7.95	238.50	-35.5	-12.96
Ganza	274	14.27	428.10	154.10	56.24
Solibao	274	11.35	540.50	66.50	24.27
Granola (check)	274	0.78	23.40	-250.6	-25.06
Igorota (check)	274	9.4	282.00	8.00	2.92

* Total cost of production includes cost of planting materials, insecticides, fertilizers and labor.
* Selling price of potato tubers was based at Php30.00 per kilo for seed purposes.

Dry Matter Content

Highly significant differences among the entries were observed in terms of percent dry matter content (Table 9). Entries 573275 and 13.1.1 had the highest dry

matter content of tubers with identical mean dry matter content of 22 % while entry MLUSA-3 had the lowest dry matter content of 18%. The percent dry matter content indicates the solid matter that comprises the tubers which is a very important composition of potatoes. It is mainly determined genetically and is dependent on the variety (Hartman et. al, 1974). The difference in the dry matter content of tubers of the different entries maybe attributed to the genotypic characteristics of each potato entry.

Table 9. Dry matter content of ten potato entries.

ENTRY	DRY MATTER CONTENT (%)
13.1.1	21ab
96-06	21[ab]
573275	22[a]
676070	19[bc]
2.21.6.2	21[ab]
MLUSA-3	18[c]
Ganza	19[bc]
Solibao	21[ab]
Granola	20[b]
Igorota	20[b]
CV (%)	4.42

*Means with the same letter are not significantly different at 5% level by DMRT

SUMMARY, CONCLUSION AND RECOMMENDATION

Summary

This study was conducted to evaluate the different potato entries grown from rooted stem cuttings and identify the highest yielding entries grown from rooted stem cuttings under Sagpat, Kibungan, Benguet condition. This was conducted in October 2007 to January 2008.

Among the ten entries evaluated, Majority of the entries were higher than the Granola and MLUSA-3 in terms of plant survival. In plant vigor, all the potato entries were vigorous except for MLUSA-3 that was less vigorous at 45 DAP.

On height, entry 13.1.1 produced the tallest plant. Based on yield performance, Ganza produced the heaviest marketable tubers followed by Solibao, 96-06, 2.21.6.2 and 13.1.1 while Granola produced the lowest yield.

For the total and the computed yield per hectare, Ganza significantly had the highest, and also gained the highest ROCE. Based on percentage dry matter content, entries 13.1.1 and 573275 significantly revealed the highest while MLUSA-3 had the lowest.

Conclusion

Ganza produced the highest marketable yield and had the highest for total and computed yield per hectare and also with ROCE. Low yield of the other entries could be due to unfavorable condition and their non- adaptability to conditions in Sagpat, Kibungan, Benguet.

Recommendation

Findings indicated that varieties Ganza and Solibao had the highest computed yield per hectare resulting to their respective high ROCE. Hence, these varieties are recommended for potato growers of Sagpat, Kibungan, Benguet.

The entries 96-06 and 2.21.6.2 are also recommended as alternative to plant considering that they also gave an average computed yield per hectare and for being resistant to late blight.

LITERATURE CITED

BADOL, E. O., F.S. BALOG-AS, and Z.J. BAUCAS, 1990. Evaluation of white potato clones for yield and resistance to late blight. Research results presented in a series of working Papers. Northern Philippines root crops research and training center. Benguet State University La Trinidad, Benguet. Pp. 1-2.

BAUTISTA, O. K. and R. C. MABESSA. 1986. Vegetable Production. University of the Philippines at Los Baňos, College of Agriculture. P. 28.

CIP. 2001. Compiled data sheet (Loose sheet). International Potato Center (CIP).

DALANG, P. A., S. T. GAYAO and C. G. KISWA. 1990. Stem Cutting: A rapid multiplication technique for potato. NPRCRTC, BSU Extension Bulletin I. Benguet State University, La Trinidad, Benguet. P.15.

DEMONTEVERDE, V. E. CHUJOY, E. GERPACIO, M. R. GERPACIO, M. T. L. OPEŇA, G. B. and D.K.SIMONGO. 1991. Potato Apical Cuttings: A promising tool for evaluation breeding material. The potato and sweet potato in Southeast Asia and the Pacific Regional Office Box 933, Manila, Philippines. Pp. 78 – 79.

DOUGLAS, H. 1987. Potatoes: Production, Marketing and Processing for developing Countries. London: West View Press. Pp. 108 – 109.

ESCOBAR, U. and P. VANDER ZAAG. 1985. Rapid Multiplication of Potatoes in the Warm Tropics: Rooting and Establishment of cuttings potato research 33. Research results presented in a series of CIP Region VIII working paper S. P. Pp. 13-21.

FRLD. 1985. Agribusiness investment profile: Philippines: Quezon City Foundation for Resource Linkage and Development Incorporation. P. 173.

GAYAO, B. T., A. BOTANGEN, P. DALANG, E. SANO, M. WALLACE and MACARIO. 1987. Economics of Table Potato Production Using Rooted Stem Cuttings. Research Results Presented in a Series of Working Papers Volume I. NPRCRTC. Benguet State University. Pp. 58 – 59.

GAYAO, M., G. TIANZA, E. SANO, BALOG-AS and V. MAVARIO. 1985. Cost and return evaluation of the white potato agribusiness production in La Trinidad, Benguet. Research Results Presented In a Series of Working Papers. Northern Philippines Root Crops and Training Center, La Trinidad, Benguet. Pp. 185 – 194.

HARRDEC. 1995. Note Worthy Potato Clones for the Humid Tropics of Southeast Asia. Los Baňos: Institute of Plant Breeding (IPB), University of the Philippines, Los Baňos, Laguna, Philippines. Pp. 1 – 3.

HARTMAN, K. J. and A. VANES 1974. Onderzoek Naar Diepergelegen Corzaken Van de Blaneuge. Vael Voel Voelighheld Van Aardappelen, I-IBVL-Oblicate 272 IBVL, Wagenginen. Pp. 130-133.

HENFLING, J. W. 1987. Late Blight.of potato. International Potato Center (CIP). Lima Peru. Revised 1987. P. 21.

Northern Philippines Root Crops Research and Training Center (NPRCRTC). 1998. Potato Production Guide. Benguet State University, La Trinidad, Benguet. Pp. 6 – 7.

PALOMAR, M. K. and R. L. TALATALA – SANICO. 1994. Standard Procedure and Guidelines for National Cooperative Testing (NCT). National Seed Industry Council. Department of Agriculture, Bureau of Plant Industry. P. 29.

RASCO, E. T. and V. T. AMANTE. 1994. Sweet Potato Variety Evaluation Southeast Asia Program for Potato Research and Development (SAPRRAD). Pp. 16 – 17.

SIMONGO, D. K. 2007. Growth, Yield and dry matter Partitioning of Potato Genotype under Organic Production at La Trinidad, Benguet. P. 25.

SMITH. O. 1977. Potatoes: Production, Storing, Processing 2nd.Connecticut: AVI Publishing Company Inc P. 77.

TECHNOGUIDE 2005. Seed Potato Production. Bureau of plant Industry. Baguio National Crop Research and Development Center (BPI – BNCRDC) Guisad, Baguio City Philippines. Pp. 5 – 16.

APPENDICES

APPENDIX TABLE. 1. Percent survival

VARIETIES	REPLICATION I	II	III	TOTAL	MEAN
13.1.1	100	100	95	295	98[a]
96-06	100	100	95	295	98[a]
573275	95	78	95	268	89[b]
676070	100	100	100	300	100[a]
2.21.6.2	95	100	100	295	98[a]
MLUSA-3	75	80	85	240	80[c]
Ganza	100	100	100	300	100[a]
Solibao	100	100	100	300	100[a]
Granola	78	75	75	288	76[a]
Igorota	85	88	90	263	88[b]
TOTAL	733	921	935	2784	93

ANALYSIS OF VARIANCE

SOURCE OF VARIATION	DEGREE OF FREEDOM	SUM OF SQUARE	MEAN SQUARE	COMPUTED F	TABULAR F .05	.01
Replication	2	98.00	4.900			
Treatment	9	219.467	243.941	14.16	2.46	3.60
Error	18	18	301.533	16.752		
Total	29	2506.800				

** - highly significant CV% = 4.41

APPENDIX TABLE 2. Plant vigor at 30 DAP

VARIETIES	REPLICATION			TOTAL	MEAN
	I	II	III		
13.1.1	3	3	3	9	3
96_06	3	3	3	9	3
573275	3	3	3	9	3
676070	3	3	3	9	3
2.21.6.2	3	3	3	9	3
MLUSA-3	3	4	3	10	3
Ganza	3	3	3	9	3
Solibao	3	3	3	9	3
Granola	2	3	3	8	3
Igorota	3	3	3	9	3
TOTAL	29	31	30	90	3

APPENDIX TABLE 3. Plant vigor at 45DAP

VARIETIES	REPLICATION I	II	III	TOTAL	MEAN
13.1.1	3	3	3	9	3
96-06	3	3	3	9	3
573275	3	3	3	9	3
676070	3	3	3	9	3
2.21.6.2	3	3	3	9	3
MLUSA-3	2	3	2	7	2
Ganza	3	3	3	9	3
Solibao	3	3	3	9	3
Granola	2	3	3	8	3
Igorota	3	3	3	9	3
TOTAL	28	30	29	87	3

APPENDIX TABLE 4. Late blight incidence at 45DAP

VARIETIES	REPLICATION			TOTAL	MEAN
	I	II	III		
13.1.1	1	2	1	4	1
96-06	1	1	1	3	1
573275	1	1	1	3	1
676070	2	2	1	5	2
2.21.6.2	1	2	1	4	1
MLUSA-3	2	1	2	5	2
Ganza	1	1	1	3	1
Solibao	1	2	2	5	2
Granola	2	2	2	6	2
Igorota	1	2	1	4	1
TOTAL	13	16	13	42	1

APPENDIX TABLE 5. Late blight incidence at 60DAP

VARIETIES	REPLICATION			TOTAL	MEAN
	I	II	III		
13.1.1	1	4	2	7	2
96-06	1	2	1	4	1
573275	2	2	2	6	2
676070	1	2	2	5	2
2.21.6.2	1	2	1	4	1
MLUSA-3	1	1	1	3	1
Ganza	2	1	1	4	1
Solibao	1	2	2	5	2
Granola	4	2	2	8	3
Igorota	2	1	2	5	2
TOTAL	16	19	17	51	2

APPENDIX TABLE 6. Initial plant height at 30 DAP

VARIETIES	REPLICATION I	II	III	TOTAL	MEAN
13.1.1	16.18	15.08	15.26	46.52	15.51[a]
96-06	12.81	12.15	11.93	36.89	12.30[bcd]
573275	9.61	10.47	10.50	30.58	10.19[e]
676070	12.45	11.00	13.59	37.04	12.35[c]
2.21.6.2	8.75	10.61	11.16	30.52	10.17[e]
MLUSA-3	13.59	12.68	13.00	39.27	13.09[bc]
Ganza	5.37	5.62	5.15	16.14	5.38[f]
Solibao	14.28	12.32	13.03	39.03	13.21[b]
Granola	11.80	11.85	11.40	35.05	11.68[d]
Igorota	12.13	9.85	11.68	33.66	11.22[dc]
TOTAL	116.97	111.63	116.1	344.67	11.49

ANALYSIS OF VARIANCE

SOURCE OF VARIATION	DEGREE OF FREEDOM	SUM OF SQUARE	MEAN SQUARE	COMPUTED F	TABULAR F .05	.01
Replication	2	1.810	0.905			
Treatment	9	191.670	21.297	32.16**	2.46	3.60
Error	18	11.921	0.662			
Total	29	205.401				

[ns] –highly significant CV% =7.07

APPENDIX TABLE 7. Final plant height 60 DAP

VARIETIES	REPLICATION I	II	III	TOTAL	MEAN
13.1.1	30.66	31.15	30.51	92.32	30.17[a]
96-06	21.95	22.70	22.43	67.08	22.36[d]
573275	17.12	16.46	16.23	49.81	20.90[e]
676070	20.50	21.46	20.00	61.95	20.65[e]
2.21.6.2	23.00	23.27	22.80	69.07	23.02[cd]
MLUSA-3	24.09	23.71	23.14	70.94	23.65[c]
Ganza	28.76	28.70	27.90	85.36	16.60[g]
Solibao	28.76	28.70	27.90	85.36	28.45[b]
Granola	18.99	19.32	18.88	57.19	19.06[f]
Igorota	21.75	20.34	20.67	62.76	20.92[e]
TOTAL	235.58	235.81	230.46	701.84	23.69

ANALYSIS OF VARIANCE

SOURCE OF VARIATION	DEGREE OF FREEDOM	SUM OF SQUARE	MEAN SQUARE	COMPUTED F	TABULAR F .05	.01
Replication	2	1.137	0.569			
Treatment	9	481.094	53.455	301.91**	2.46	3.60
Error	18	3.187	0.177			
Total	29	485.410				

** _ highly significant CV% = 1.86

APPENDIX TABLE 8. Number of marketable tubers

VARIETIES	REPLICATION I	II	III	TOTAL	MEAN
13.1.1	132	156	128	416	139[a]
96-06	116	117	98	331	110[c]
573275	57	41	50	148	49[g]
676070	137	94	119	350	117[bc]
2.21.6.2	103	79	206	388	129[a]
MLUSA-3	148	59	75	282	94[e]
Ganza	117	93	149	359	120[f]
Solibao	101	92	122	315	105[d]
Granola	20	10	16	46	15[j]
Igorota	82	78	112	272	91[f]
TOTAL	1013	819	1075	2907	97

ANALYSIS OF VARIANCE

SOURCE OF VARIATION	DEGREE OF FREEDOM	SUM OF SQUARE	MEAN SQUARE	COMPUTED F	TABULAR F .05	TABULAR F .01
Replication	2	27343.400	15671.700			
Treatment	9	58281.467	6475.719	0.88[ns]	2.46	3.60
Error	18	131871.933	7326.219			
Total	29	217496.800				

[ns] - not significant CV% = 26.29

APPENDIX TABLE 9. Weight of marketable tubers

VARIETIES	REPLICATION I	II	III	TOTAL	MEAN
13.1.1	3.15	3.4	2.95	9.5	3.17[b]
96-06	3.8	3.6	3.85	11.25	3.75[ab]
573275	1.7	2.15	1.93	5.78	1.93[c]
676070	3.45	2.6	3.025	9.075	3.025[b]
2.21.6.2	2.5	2.45	5.3	10.25	3.42[b]
MLUSA-3	3.35	1.8	2.8	7.95	2.65[bc]
Ganza	4.52	4.15	5.6	14.27	4.76[a]
Solibao	3.65	3.15	4.55	11.35	3.78[ab]
Granola	0.2	0.18	0.4	0.78	0.26[d]
Igorota	2.9	2.8	3.7	9.4	3.13[b]
TOTAL	29.22	26.28	34.105	89.575	2.99

ANALYSIS OF VARIANCE

SOURCE OF VARIATION	DEGREE OF FREEDOM	SUM OF SQUARE	MEAN SQUARE	COMPUTED F	TABULAR F .05	.01
Replication	2	3.125	1.560			
Treatment	9	39.787	4.421	11.90**	2.46	3.60
Error	18	6.689	0.372			
Total	29	49.601				

** - highly significant CV% = 20.41

APPENDIX TABLE 10. Number of non-marketable tubers

VARIETIES	REPLICATION I	II	III	TOTAL	MEAN
13.1.1	134	103	103	340	113[a]
96-06	24	53	18	95	32[b]
573275	70	46	58	174	58[b]
676070	36	66	51	153	51[b]
2.21.6.2	90	145	72	307	102[a]
MLUSA-3	125	109	171	405	135[a]
Ganza	45	48	72	165	55[b]
Solibao	51	47	84	182	61[b]
Granola	50	62	37	149	50[b]
Igorota	53	34	38	125	42[b]
TOTAL	678	713	704	2.095	70

ANALYSIS OF VARIANCE

SOURCE OF VARIATION	DEGREE OF FREEDOM	SUM OF SQUARE	MEAN SQUARE	COMPUTED F	TABULAR F .05	.01
Replication	2	66.067	33.033			
Treatment	9	31952.167	3550.241	730**	2.46	3.60
Error	18	8753.933	486.330			
Total	29	40772.167				

** - highly significant CV% = 21.58

APPENDIX TABLE 11. Weight of non-marketable tubers

VARIETIES	REPLICATION I	II	III	TOTAL	MEAN
13.1.1	0.9	0.75	0.75	2.4	0.8[a]
96-06	0.45	0.45	0.15	1.05	0.35[bc]
573275	0.6	0.25	0.425	1.175	0.425[bc]
676070	0.4	0.5	0.45	1.35	0.45[bc]
2.21.6.2	0.49	0.85	0.5	1.84	0.61[ab]
MLUSA-3	0.8	0.9	1.0	2.7	0.9[a]
Ganza	0.32	0.75	0.7	1.77	0.59[ab]
Solibao	0.65	0.3	0.95	1.9	0.63[ab]
Granola	0.2	0.25	0.2	0.65	0.22[c]
Igorota	0.5	0.35	0.5	1.35	0.45[bc]
TOTAL	36.99	5.35	5.625	16.285	0.54

ANALYSIS OF VARIANCE

SOURCE OF VARIATION	DEGREE OF FREEDOM	SUM OF SQUARE	MEAN SQUARE	COMPUTED F	TABULAR F .05	.01
Replication	2	0.006	0.003			
Treatment	9	1.151	0.128	3.98**	2.46	3.60
Error	18	0.578	0.032			
Total	29	1.736				

** - highly significant CV% = 23.02

APPENDIX TABLE 12. Total yield (kg/5m^2)

VARIETIES	REPLICATION I	II	III	TOTAL	MEAN
13.1.1	4.05	4.15	3.7	11.9	3.97^{ab}
96-06	4.25	4.05	4.0	12.3	4.1^{ab}
573275	2.3	2.4	2.355	7.055	2.35^{c}
676070	3.75	3.1	3.48	10.33	3.44^{bc}
2.21.6.2	2.99	3.3	5.8	12.09	4.03^{ab}
MLUSA-3	4.15	2.7	3.6	10.45	3.48^{bc}
Ganza	4.84	4.1	6.3	15.24	5.08a^{a}
Solibao	4.3	3.45	5.5	13.25	4.42^{ab}
Granola	0.4	0.4	0.6	1.4	0.47^{d}
Igorota	3.4	3.15	4.2	10.75	3.58^{b}
TOTAL	34.43	30.8	39.585	104.765	34.92

ANALYSIS OF VARIANCE

SOURCE OF VARIATION	DEGREE OF FREEDOM	SUM OF SQUARE	MEAN SQUARE	COMPUTED F	TABULAR F .05	.01
Replication	2	3.851	1.926			
Treatment	9	44.175	4.908	11.64**	2.46	3.60
Error	18	7.589	0.422			
Total	29	55.615				

** - highly significant CV% = 18.59

APPENDIX TABLE 13. Computed yield (ton/ha)

VARIETIES	REPLICATION I	II	III	TOTAL	MEAN
13.1.1	8.10	8.30	7.40	23.8	7.93[ab]
96-06	8.50	8.10	8.00	24.6	8.2[ab]
573275	4.60	4.80	4.71	14.11	4.70[c]
676070	7.50	6.20	6.96	20.66	6.87[bc]
2.21.6.2	5.98	6.60	11.60	24.18	8.06[ab]
MLUSA-3	8.30	5.40	7.20	20.9	6.97[bc]
Ganza	9.68	8.20	12.60	30.48	10.16[a]
Solibao	8.60	7.20	11.00	26.5	8.83[ab]
Granola	0.80	0.80	1.20	2.8	0.93[d]
Igorota	6.80	6.30	8.40	21.5	7.17[b]
TOTAL	68.86	61.6	79.07	209.53	69.91

ANALYSIS OF VARIANCE

SOURCE OF VARIATION	DEGREE OF FREEDOM	SUM OF SQUARE	MEAN SQUARE	COMPUTED F	TABULAR F .05	.01
Replication	2	14.916	7.458			
Treatment	9	177.836	19.760	11.96**	2.46	3.60
Error	18	29.745	1.653			
Total	29	222.498				

** - highly significant CV% = 18.38

APPENDIX TABLE 14. Dry Matter Content

VARIETIES	REPLICATION I	II	III	TOTAL	MEAN
13.1.1	21	22	21	64	21[ab]
96-06	20	21	21	62	21[ab]
573275	21	21	24	66	22[a]
676070	19	19	18	56	19[bc]
2.21.6.2	21	21	21	63	21[ab]
MLUSA-3	18	17	18	53	18[c]
Ganza	20	20	18	58	19[bc]
Solibao	21	21	20	62	21[ab]
Granola	20	21	20	61	20[b]
Igorota	19	21	19	59	20[b]
TOTAL	200	204	200	604	20

ANALYSIS OF VARIANCE

SOURCE OF VARIATION	DEGREE OF FREEDOM	SUM OF SQUARE	MEAN SQUARE	COMPUTED F	TABULAR F .05	.01
Replication	2	1.067	0.533			
Treatment	9	46.133	5.126	5.13**	2.46	3.60
Error	18	14.267	0.793			
Total	29	68.139				

** - highly significant CV% = 4.42%