BIBLIOGRAPHY

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ABSTRACT

Eight sweet potato genotypes were characterized and evaluated to determine their agronomic characters and to determine the sweetpotato genotypes adapted in Poblacion, Kibungan, Benguet.

The eight sweetpotato genotypes varied on their leaf, stem and storage root characters. Results showed that on the plant survival, plant vigor, mature leaf size, petiole length, vine length, vine diameter, number of marketable storage roots, number of non-marketable storage roots, dry matter content and harvest index, the eight sweetpotato genotypes significantly differ.

Peke Negro OP, Bengueta and Kalbo-oy have 100% survival at 30 DAP. Miracle OP, Violet OP and Bengueta OP were vigorous at 60 DAP and at 90 DAP most of the genotypes were vigorous. Wagwag OP has the largest leaf while Kalbo-oy has the longest petiole. Bengueta has the longest vines while Miracle OP has the thickest vines. Miracle OP obtained the highest number of marketable storage roots while Violet OP obtained the highest number of non-marketable storage roots. As to the weight of marketable, non-marketable storage roots and average storage root yield, no significant

differences were observed. Kawitan OP significantly had the highest dry matter content and harvest index among the eight sweetpotato genotypes.

On the sensory evaluation of boiled storage roots, the color and consistency of boiled storage roots varied. Peke Negro was rated as the sweetest among the eight sweetpotato genotypes. Most of the sweetpotato genotypes showed positive ROCE.

Miracle OP, Peke Negro OP, Wagwag OP and Bengueta are recommended at Poblacion, Kibungan, Benguet. Based on storage root yield, ROCE, resistance to scab disease and vigor, these sweetpotato genotypes can be profitably grown. Furthermore, characterization of sweetpotato germplasm should be a continuing activity.

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EXTENSION
RESEARCH
PRODUCTION
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TABLE OF CONTENTS

INTRODUCTION

Sweetpotato (*Ipomoea batatas* L.) is an important crop in the Cordillera. The root is used as a staple food and the herbage is used as a main ingredient of swine in most places. The crop is cultivated for its edible or fleshy storage roots and green tops (NPRCRTC, 1990).

In the Philippines, sweetpotato is grown in rice fields just after rice, in backyards, small gardens and in swidden farm (NPRCRTC, 1990).

The potential of sweetpotato is recognized because of its many uses, it is utilized as human food, animal feed and as industrial raw material. According to Mackay *et al.* (1989) root crops, particularly sweetpotatoes are often served as substitute for the carbohydrate needs of most Filipinos especially those living in the mountains or remote areas.

Sweetpotato as an important crop in the highlands must be given importance in such a way that it will have high yield or production which will able to supply and substitute the need of the people in times of food shortage.

Production of sweetpotatoes commercially could be considered a very important factor by farmers in order to sustain food supply and other products derived from sweetpotatoes. One way to attain this is by choosing and planting the right varieties with good agronomic characteristics.

In the survey conducted by NPRCRTC (1990) sweetpotato farmers expressed the need for improved varieties with good eating quality, high yielding, resistant to pests and diseases and adapted to local conditions. With this situation, there is a need to introduce other varieties that are high yielding and acceptable to the preferences of farmers as well

as to consumers. Thus, in order to determine the good varieties of sweetpotato and to meet the demands of farmers and consumers, characterization and evaluation is necessary.

Morphological characterization of accessions in a collection is important not only to have a description of each accession but as well as identifying duplicate accessions (Huaman, 2008). In addition, many of the characteristics that are recorded on individual accessions can serve as diagnostic descriptors for the accessions. Such diagnostic characters help genebank curators keep track of an accession and check for the genetic integrity over a number of years of conservation (IBPGR, 1981).

The study was conducted to determine the agronomic characters of open-pollinated sweetpotato genotypes in Poblacion, Kibungan, Benguet and to determine the sweetpotato genotypes that are adapted in the locality.

The study was conducted at Poblacion, Kibungan, Benguet from October 2007 to March 2008.

REVIEW OF LITERATURE

Varietal Characterization

Variety characterization is the process of documenting variety traits that are useful in distinguishing one variety from other varieties. In judging the worth of a variety, some of these traits are useful not only for variety identification but as well as for evaluation. In characterization, traits used are generally more stable and need not to be taken repetitively in various stages of variety evaluation. In addition, characterization data are used to eliminate duplicates in a collection, to assess agronomic and utilization potential of an accession, to check accuracy of labeling in field experiments, and to serve as basis for rouging mixtures in multiplication fields (Rasco and Amante, 1994).

Characterization Studies in Sweetpotato

In a study conducted by Rebujio (2003) on the morphological characterization, diversity analysis and evaluation of sweetpotato genotypes results show that twenty sweetpotato genotypes significantly differ for all characters measured. The result showed that Tagalog, PSBSP 17 and Kawitan produced the highest storage root yield. Diversity indices show low variation for qualitative characters and high variation quantitative characters.

Shagol (2001) studied the morphological characters associated with yield in sweetpotato and found out that the ten sweetpotato varieties are variable in morphology and there was no strong association between the morphological characters and yield. Based on the results, growth and yield performance of ten sweetpotato varieties depends on the genetic constitution and the environment where they were grown.

A study on characterization and evaluation of " Kalbo–oy" strains collected from different sources by Sanggawa (2004) showed that the different "Kalbo-oy" strains were morphologically similar in terms of plant type, leaf characters (shape, central lobe, and foliage color), storage root formation and storage root defects. However, the "Kalbo-oy" strains were significantly different in terms of canopy cover, number of leaves, leaf area, number of nodes and vine length. The results showed that "Kalbo-oy" strains are very variable in some morphological characteristics and storage root yield parameters.

Alfonso (2006) conducted a study on the characterization, evaluation, diversity and cluster analysis of sweetpotato varieties in La Trinidad, Benguet results show that the qualitative and quantitative characteristics of sixteen sweetpotato varieties varied. It was found out that the sixteen sweetpotato varieties exhibited highly significant differences for all quantitative characters measured.

MATERIALS AND METHODS

Land Preparation

An area of 120 m^2 was manually cleaned and prepared for planting. The area was divided into three blocks and each block consists of eight plots each measuring 1 x 5 m. The experiment was laid out using randomized complete block design (RCBD).

Treatments

The genotypes were taken from the Northern Philippine Rootcrops Research and Training Center, Benguet State University La Trinidad, Benguet while the check variety "Kalbo-oy" was taken from Kibungan, Benguet.

The genotypes used were:

CODE	GENOTYPE
G_1	Darwin OP
G_2	Kawitan OP
G_3	Miracle OP
G_4	Peke Negro OP
G_5	Violet OP
G_6	Wagwag OP
G_7	Bengueta (check)
G_8	Kalbo-oy(check)

Planting and Planting Distance

Stem cuttings with a length of 25-30 cm were planted at one cutting per hill. Spacing was 30 cm between rows and 30 cm between hills.

Cultural Management Practices

All cultural management practices such as irrigation, weeding, and hilling-up were uniformly employed.

Data Gathered:

The descriptors list for sweetpotato by Huaman (1991) was used.

1. Plant survival (%). This was the percentage of plants that survived and it was taken by counting plant stand 30 DAP and computed using the formula:

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

2. Plant vigor. This was taken at 60 and 90 DAP 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	Less vigorous
3	Better than less vigorous	Vigorous
4	Plants are moderately strong with robust stems and leaves; leaves are light green in color	Moderately vigorous
5	Plants are strong with robust stems and leaves; leaves are dark green in color	Highly vigorous

3. Plant type. The growth habit at 90 DAP was described using the scale as follows:

SCALE	DESCRIPTION
3	Erect (<75)
5	Semi-erect (75-150)

SCALE	DESCRIPTION
7	Spreading (151-250 cm)
9	Extremely spreading (>250)

4. Leaf characters

a. Mature leaf shape. This was taken at 90 DAP and the leaves on the 8th node was considered. This was described by a three- digit code where the first digit (hundreds) indicates the type of the most common expression of leaf lobing, the second digit (tens), the average total number of lobes, and the third digit (units) indicates the shape of the central lobe of leaves.

TYPE OF LEAF LOBING	NO. OF LOBES	SHAPE OF CENTRAL LEAF LOBE
0-No lateral lobes		0-Absent
1-Very slight (teeth)	1	1-Toothed
3-Slight	3	2-Triangular
5-Moderate	5	3-Semi-circular
7-Deep	7	4-Semi-elliptic
9-Very deep	9	5-Elliptic
		6-Lanceolate
		7-Oblanceolate
		8-Linear (broad)
		9-Linear (narrow)

b. Mature leaf size. This was measured from the basal lobes to the tip of the leaves and was recorded using the following scale:

SCALE	DESCRIPTION
3	Small (<8cm)
5	Medium (8-15cm)
7	Large (16-25cm)
9	Very large (>25cm)

c. Abaxial leaf vein pigmentation. This refers to the distribution of anthocyanin pigmentation shown in the veins of the lower surface of leaves. The most frequent expression was recorded at 90 DAP using the 1-9 scale follows:

SCALE	DESCRIPTION
1	Yellow
2	Green
3	Purple spot in the base of main rib
4	Purple spots in several veins
5	-Main rib partially purple
6	Main rib mostly or totally purple
7	All veins partially purple
8	All veins mostly or totally purple
9	Lower surface and veins totally purple

d. Petiole pigmentation. Refers to the anthocyanin pigmentation in the petioles of leaves. The most predominant color was recorded as follows and was taken at 90 DAP using the 1-9 scale as follows:

SCALE	DESCRIPTION
1	Green
2	Green with purple near stem
3	Green with purple near leaf
4	Green with purple at both ends
5	Green with purple spots throughout petiole
6	Green with purple stripes
7	Purple with green near leaf
8	Some petioles purple, others green
9	Totally or mostly purple

e. Foliage color. The color of fully expanded mature and immature leaves was taken at 90 DAP using the 1-9 scales as follows:

SCALE	DESCRIPTION
1	Yellow-green
2	Green
3	Green with purple edge
4	Grayish-green
5	Green with purple veins on upper surface
6	Slightly purple
7	Mostly purple
8	Green upper, purple lower
9	Purple both surfaces

f. Petiole length. The petiole length was measured from the base to the insertion with the blade and was recorded at 90 DAP using a scale as follows:

SCALE	DESCRIPTION
1	Very short (<10 cm)
3	Short (10-20 cm)
5	Intermediate (21-30 cm)
7	Long (31-40 cm)
9	Very long (>40 cm)

5. Vine/ Stem characters

a. Vine length and diameter. This was obtained using the following scales:

INTERNODE LENGTH	INTRERNODE DIAMETER
1-Very short (3 cm)	1- Very thin (4 mm)
3-Short (3-5 cm)	3- Thin (4-6 mm)
5-Intermediate (6-9 cm)	5- Intermediate (7-9 mm)
7-Long (10-12 cm)	7- Thick (10-12 mm)
9- Very long (>12 cm)	9- Very thick (>12 mm)

b. Vine pigmentation. This refers to the presence of anthocyanin pigmentation in the vines besides the green color. This was taken at 90 DAP using the following scales:

PREDOMINANT VINE COLOR	SECONDARY VINE COLOR
1-Green	0-Absent
3-Green with few purple spots	1-Green base
4-Green with many purple spots	2-Green tip

PREDOMINANT VINE COLOR	SECONDARY VINE COLOR
5-Green with many dark purple spots	3-Green nodes
6-Mostly purple	4-Purple base
7-Mostly dark purple	5-Purple tip
8-Totally dark purple	6-Purple nodes
9-Totally dark purple	

c. Vine tip pubescence. Refers to the degree of hairiness of immature leaves recorded at the apex of the vines and was taken at 60 DAP using a rating scale as follows:

SCALE	DESCRIPTION
0	Absent
3	Sparse
5	Moderate
7	Heavy

6. Storage root characters

a. Storage root formation. The arrangement of storage roots on the underground stems was described as follows:

SCALE	DESCRIPTION
1	Closed cluster
3	Open cluster
7	Dispersed
9	Very dispersed

b. Storage root shape. This was described as follows:

SCALE	DESCRIPTION
1	Round
2	Round elliptic
3	Elliptic
4	Ovate
5	Obovate
6	Oblong
7	Long oblong
8	Long elliptic
9	Long irregular or curved

c. Storage root surface defects. This was described as follows:

SCALE	DESCRIPTION
0	Absent
1	Alligator- like skin
2	Veins
3	Shallow horizontal constrictions
4	Deep horizontal constrictions
5	Shallow longitudinal constrictions
6	Deep longitudinal constrictions
7	Deep constrictions and deep grooves

d. Storage root skin color. This was described as follows:

PREDOMINANT SKIN COLOR	INTENSITY OF PREDOMINANT SKIN COLOR
1-White	1-Pale
2- Cream	2-Intermediate
3-Yellow	3-Dark
4-Orange	
5- Brownish orange	
6-Pink	
7-Red	
8-Purple red	
9-Dark purple	

e. Storage root flesh color. The color of the cross section of fresh storage roots was described using the scales from 1-9 as follows:

PREDOMINANT SKIN COLOR	SECONDARY FLESH COLOR
1-White	0-Absent
2-Cream	1- White
3 -Dark cream	2- Cream
4 -Pale yellow	3- Yellow
5-Dark yellow	4- Orange
6-Pale orange	5- Pink
7-Intermediate orange	6- Red
8-Dark orange	7- Purple red
9-Strongly pigmented with anthocyanins	8-Purple
	9-Dark purple

7. Disease (scab) and insect (leaf folder and beetles) incidence.

a. Scab disease. This was evaluated by rating the degree of disease using the Rasco and Amante (1994) rating scale as follows:

SCALE	DESCRIPTION	REACTION
1	No symptom	Highly resistant
2	Few lesions on leaves and stem; Slight infection	Resistant
5	Several lesions on leaves and stems; No leaf deformation	Moderately resistant
7	Several lesions on leaves and stems; Lesions coalesced with slight leaf deformation	Susceptible
9	Lesions on leaves and stems coalesced; Severe leaf deformation and stem twisting	Highly susceptible

b. Beetle and leaf folder. This was evaluated by rating the degree of insect damage using the Rasco and Amante(1994) rating scale as follows:

SCALE	DESCRIPTION
1	Heavy infestation (more than 50%)
2	Medium heavy infestation (25- 50 %)
3	Medium infestation (5- 25 %)
4	Medium light infestation (1- 5 %)
5	Light infestation (less than 1%)

8. Yield and yield components

a. Number and weight of marketable storage roots (kg). All storage roots with a diameter of 3 cm and above and free from injuries were counted and weighed at harvest.

b. Number and weight of non- marketable storage roots (kg). These were storage roots with a diameter of less than 3 cm and have sufficient damage were weighed at harvest.

c. Storage yield per plant (kg). Storage roots from each treatment per replication were weighed at harvest.

9. Sensory evaluation. Sample roots were boiled and evaluated according to consistency, color, and sweetness using the following scales:

CONSISTENCY OF BOILED STORAGE ROOTS	COLOR OF BOILED STORAGE ROOTS	SWEETNESS OF BOILED STORAGE ROOTS
1-Watery	1-Some beige	1- Bland
2-Extremely soft	2-Much beige	2- Slightly sweet
3-Very soft	3-Sligthly green or	3-Moderately sweet
4-Soft	4-Green	4- Sweet
5-Slightly hard	5- Grey	5-Very sweet
6-Moderately hard	6- Beige and green	
7-Hard	7- Beige and grey	
8-Very hard	8-Beige and purple	
9-Very hard and not cooked	9-Purple	

10. Dry matter content. The dry matter content of storage roots was determined by getting 100g sample from a mixture of two to three sample roots from 5 plants per treatment, cut into pieces longitudinally and transversely. Samples were oven dried at 60 ^{0}C for 4 to 5 days. Dry matter content was obtained using the following formula:

a. MC = $\frac{\text{fresh weight – dry weight}}{\text{fresh weight}}$ x 100

b. % DMC=100-% MC

11. Harvest index. This was computed using the formula as follows:

$$HI = \frac{SRDW}{LDW+VDW+SRDW+RDW}$$

Where:

SRDW= Storage root dry weight

LDW=Leaf dry weight

VDW= Vine dry weight

RDW= Root dry weight

12. Return on cash expense (ROCE). This was computed using the following formula:

$$ROCE = \frac{\text{Net Income}}{\text{Total cost of production}} \text{ X } 100$$

Data Analysis

Data was statistically analyzed using analysis of variance for randomized complete block design. Significance of difference between treatments was tested using the Duncan's Multiple Range Test (DMRT).

RESULTS AND DISCUSSION

Plant Survival

Table 1 shows the percentage survival of eight sweetpotato genotypes. Highly significant differences were observed among the sweetpotato genotypes. Most of the genotypes evaluated have high percentage of survival of more than 95%. However, Kawitan OP gave the lowest percentage survival of 86.67%.

Table 1. Percentage survival of eight sweetpotato genotypes at 30 days after planting (DAP)

GENOTYPE	SURVIVAL (%)
Darwin OP	95.56[a]
Kawitan OP	86.67[b]
Miracle OP	95.56[a]
Peke Negro OP	100.00[a]
Violet OP	97.78[a]
Wagwag OP	96.67[a]
Bengueta (check)	100.00[a]
Kalbo-oy (check)	100.00[a]
CV (%)	3.25

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

Plant Vigor

Highly significant differences were observed on the plant vigor of the eight sweetpotato genotypes at 60 and 90 DAP (Table 2). It was observed that Miracle OP Violet OP and Bengueta were the most vigorous except for Darwin OP, Kawitan OP and Kalbo-oy OP which were vigorous and moderately vigorous. Figure 1-4 present the plants at 30, 60, 90 and 120 DAP.

Table 2. Plant vigor of eight sweetpotato genotypes at 60 and 90 days after planting (DAP)

GENOTYPE	PLANT VIGOR	
	60 DAP	90 DAP
Darwin OP	3.00^{c}	3.67^{b}
Kawitan OP	3.67^{bc}	4.00^{b}
Miracle OP	5.00^{a}	5.00^{a}
Peke Negro OP	4.33^{ab}	5.00^{a}
Violet OP	5.00^{a}	5.00^{a}
Wagwag OP	4.67^{a}	5.00^{a}
Bengueta (check)	5.00^{c}	5.00^{a}
Kalbo-oy (check)	3.67^{bc}	4.67^{a}
CV (%)	10.01	6.40

Means with the same letter are not significantly different at 5% level by DMRT.
Rating scale (1-5): 1 - Poor vigor; 2 – Less vigorous; 3 – Vigorous; 4 – Moderately vigorous, 5 – Highly vigorous

Fig. 1. Sweetpotato genotypes at 30 DAP

Fig . 2. Sweetpotato genotypes at 60 DAP

Fig. 3. Sweetpotato genotypes at 90 days after planting (DAP)

Fig. 4. Sweetpotato genotypes at 120 days after planting (DAP)

Plant Type

Most of the sweetpotato genotypes were spreading except for Miracle OP that was semi-erect and Bengueta that was extremely spreading.

Leaf Characters

Mature Leaf Shape

The eight sweetpotato genotypes varied in their type of leaf lobing, lobe number and shape of central lobe (Table 3).

Mature Leaf Size

Mature leaf size of eight sweetpotato genotypes are shown in Table 3. Significant differences were observed among the sweetpotato genotypes. Wagwag OP has the largest leaf of 11.12 cm which is comparable with Miracle OP and Violet OP with 10.36 cm and 10.19 cm respectively. On the other hand, Darwin OP has the smallest leaf of 8.43 cm.

Abaxial Leaf Vein Pigmentation

Abaxial leaf vein pigmentation of the eight sweetpotato genotypes are shown in Table 3. Green abaxial leaf vein pigmentation was observed from Darwin OP, Peke Negro OP, Wagwag OP and Kalbo-oy. On the other hand, main rib partially purple was observed from Miracle OP and Violet OP while Kawitan OP and Bengueta have abaxial leaf vein pigmentation of all the veins partially purple.

Petiole Pigmentation

Green petiole pigmentation was observed from Peke Negro OP, Wagwag OP and Kalbo-oy. Green with purple stripes was observed from Violet OP while Bengueta has green with purple near leaf petiole pigmentation. Darwin OP and Miracle OP have green with purple spots throughout petiole while Kawitan OP has totally or mostly purple petiole pigmentation (Table 3).

Foliage Color

The color of the mature and immature leaves of eight sweetpotato genotypes are shown in Table 3. Most of the genotypes have green mature leaf color except for Darwin OP with a mature leaf color of green with pigmented edge. However, the different sweetpotato genotypes showed variability in terms of immature leaf color.

Petiole Length

Petiole length of eight sweetpotato genotypes significantly differed (Table 3). Kalbo-oy significantly gave the longest petiole comparable with Miracle OP and Wagwag OP while Darwin OP has the shortest petiole.

Vine Characters

Vine Length

Results showed highly significant differences on the vine length of the eight sweet potato genotypes (Table 4). It was observed that Bengueta significantly had the longest vines as compared with the other genotypes.

Table 3. Leaf characters of eight sweetpotato genotypes

GENOTYPE	MATURE LEAF SHAPE			MATURE LEAF SIZE	FOLIAGE COLOR		PETIOLE LENGTH	ABAXIAL LEAF VEIN PIGMENTATION	PETIOLE PIGMENTATION
	Type of Lobing	No. of Lobe	Shape of Central Lobe		Immature Leaf	Mature Leaf			
Darwin OP	Moderate	5	Semi-elliptic	7.94[c]	Green with pigmented edge	Green with purple veins on upper surface	7.94[c]	Green	Green with purple spots throughout petiole
Kawitan OP	Moderate	3	Semi-elliptic	10.20[abc]	Green	Mostly purple	10.20[abc]	All veins partially purple	Totally or mostly purple
Miracle OP	Very slight	1	Triangular	11.39[ab]	Green	Slightly purple	11.39[ab]	Main rib partially purple	Green with purple spots throughout petiole
Peke Negro OP	Very deep	5	Linear	9.69[bc]	Green	Green with purple edge	9.69[bc]	Green	Green
Violet OP	Slight	3	Semi-elliptic	10.29[abc]	Green	Green with purple edge	10.29[abc]	Main rib partially purple	Green with purple stripes
Wagwag OP	Deep	5	Elliptic	10.92[ab]	Green	Green with purple edge	10.92[ab]	Green	Green
Bengueta (check)	Very slight	1	Toothed	10.17[abc]	Green	Purple both surfaces	10.17[abc]	All veins partially stripes	Green with purple near leaf
Kalbo-oy (check)	Moderate	3	Semi-elliptic	12.36[a]	Green	Yellow green	12.36[a]	Green	Green

Means in a column followed by a common letter are not significantly different from each other at 5% level DMRT

Vine Diameter

Results showed highly significant differences on vine diameter of the eight sweetpotato genotypes (Table 4). Miracle OP significantly had the thickest vines followed by Kalbo-oy. Thin vines were observed from Darwin OP.

Table 4. Vine characters of the eight sweetpotato genotypes

GENOTYPE	VINE LENGTH	VINE DIAMETER	VINE PIGMENTATION	VINE TIP PUBESCENCE
Darwin OP	2.28[b]	3.44-[c]	Green with many purple spots	Moderate
Kawitan OP	2.20[b]	2.67[d]	Totally dark purple	Moderate
Miracle OP	2.28[b]	5.11[a]	Green with many purple spots	Heavy
Peke Negro OP	2.39[b]	3.56[c]	Green	Moderate
Violet OP	2.49[b]	4.11[bc]	Green with many purple spots	Heavy
Wagwag OP	2.20[b]	3.89[bc]	Green	Heavy
Bengueta (check)	3.69[a]	4.11[b]	Green with few purple spots	Heavy
Kalbo-oy (check)	2.50[b]	4.33[b]	Green	Sparse
CV (%)	10.20	10.18		

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

Vine Pigmentation

Peke Negro OP, Wagwag OP and Kalbo-oy were noted to have green vines. Darwin OP and Miracle OP have green with many purple spots while green with many dark purple spots was observed from Violet OP, green with few purple spots was

observed from Bengueta and totally dark purple was observed from Kawitan OP (Table 4).

Vine Tip Pubescence

Table 4 shows the vine tip pubescence of eight sweetpotato genotypes. Miracle OP, Violet OP, Wagwag OP and Bengueta has heavy vine tip pubescence while the rest of the sweetpotato genotypes have moderate vine tip pubescence except for Kalbo-oy, which has a sparse vine tip pubescence.

Storage Root Characters

Table 5 summarizes the storage root formation, storage root shape, storage root surface defects, storage root skin color and storage root flesh color of eight sweetpotato genotypes.

Storage Root Formation

Most of the sweetpotato genotypes have dispersed storage root formation. Peke Negro OP, Violet OP, Wagwag OP, Bengueta and Kalbo-oy have dispersed storage root formation while Darwin OP, Kawitan OP and Miracle OP have open cluster storage root formation.

Storage Root Shape

Storage root shape of eight sweetpotato genotypes varied. Darwin OP and Miracle OP have obovate shape while Peke Negro OP was ovate. Long elliptic storage root shape was observed from genotypes Kawitan OP and Violet OP while the rest,

Bengueta, Kalbo-oy and Wag-wag OP have round elliptic, elliptic and long irregular or curved storage root shape respectively.

Storage Root Surface Defects

Darwin OP, Peke Negro OP and Violet OP were observed to have deep horizontal constrictions, deep longitudinal constrictions, deep constrictions and deep grooves. Kawitan OP shows shallow longitudinal constrictions while Kawitan OP has veins storage root surface defects. On the otherhand, absence of storage root surface defects were observed from Wagwag OP, Kalbo-oy and Miracle OP.

Storage Root Skin Color

It was observed that Darwin OP, Kawitan OP and Violet OP have a purple red skin color of storage roots. White skinned storage roots were observed from Miracle OP, Wagwag OP and Kalbo-oy. On the other hand, Peke Negro OP has red skinned storage roots while Bengueta has brown skinned storage roots of storage root. The intensity of storage root skin color differs among the genotypes.

Storage Root Flesh Color

The storage roots flesh color of the eight sweetpotato genotypes varies from white to strongly pigmented with anthocyanin. Darwin OP, Miracle OP, Peke Negro OP and Kalbo-oy have white flesh while Kawitan OP and Violet OP have a storage root flesh strongly pigmented with anthocyanin. Wagwag OP was observed to have a pale yellow flesh while Bengueta has a pale orange flesh.

Table 5. Storage root characters of the eight sweetpotato genotypes

GENOTYPE	STORAGE ROOT FORMATION	STORAGE ROOT SHAPE	STORAGE ROOT SURFACE DEFECTS	STORAGE ROOT SKIN COLOR		STORAGE ROOT FLESH COLOR
				Predominant Color	Intensity of Predominant Color	
Darwin OP	Open Cluster	Obovate	Deep horizontal constrictions	Purple red	Pale	White
Kawitan OP	Open Cluster	Long elliptic	Veins	Purple red	Dark	Strongly pigmented with anthocyanin
Miracle OP	Dispersed	Obovate	Absent	White	Intermediate	White
Peke Negro OP	Dispersed	Ovate	Deep longitudinal constrictions	Red	Intermediate	White
Violet OP	Dispersed	Long elliptic	Deep constrictions and deep grooves	Purple Red	Pale	Strongly pigmented with anthocyanin
Wagwag OP	Dispersed	Long irregular or curved	Absent	White	Intermediate	Pale yellow
Bengueta (check)	Dispersed	Round elliptic	Shallow longitudinal constrictions	Brown	Intermediate	Pale orange
Kalbo-oy (check)	Dispersed	Elliptic	Absent	White	Dark	White

Disease Incidence and Insect Infestation

Scab Disease Incidence

Table 6 shows the leaf scab damaged of the eight sweetpotato genotypes. It was observed that most of the genotypes were highly resistant at 90 and 120 days after planting except for Darwin OP that was least resistant.

Insect (Beetle and Leaf Folder) Infestation

Medium light infestations to light infestation of beetles were observed among the eight sweetpotato genotypes evaluated. At 90 DAP, Darwin OP, Miracle OP, Peke Negro OP, Violet OP and Kalbo-oy were lightly infested while the rest were observed to

Table 6. Reaction to scab disease of the eight sweetpotato genotypes

GENOTYPE	REACTION	
	90 DAP	120 DAP
Darwin OP	2.67	3.33
Kawitan OP	1.00	1.00
Miracle OP	1.00	1.00
Peke Negro OP	1.00	1.00
Violet OP	1.00	1.00
Wagwag OP	1.00	1.00
Bengueta (check)	1.00	1.00
Kalbo-oy (check)	1.33	2.33

Rating Scale (1-7): 1-Highly resistant; 3-Resistant; 5–Moderately resistant, 7-Susceptible

have a medium light infestation. At 120 DAP, most of the genotypes have medium light infestation except for Miracle OP, Peke Negro OP and Wagwag OP with light infestation. On the other hand, all the genotypes were not infested with leaf folder (Table 7).

Yield and yield components

Number and Weight of Marketable Storage Roots

As shown in Table 8, there were significant differences among the genotypes in terms of number of marketable storage roots. Miracle OP produced the most numerous storage roots (65.00) followed by Wagwag OP (49.33). On the other hand, there were no

Table 7. Reaction to beetle of the eight sweetpotato genotypes

GENOTYPE	REACTION	
	90 DAP	120 DAP
Darwin OP	5.00	4.67
Kawitan OP	4.67	4.33
Miracle OP	5.00	5.00
Peke Negro OP	5.00	5.00
Violet OP	5.00	4.33
Wagwag OP	4.67	5.00
Bengueta (check)	4.67	4.00
Kalbo-oy (check)	5.00	4.33

Rating Scale (1-5): 1-Heavy infestation; 2-Medium heavy infestation; 3-Medium infestation; 4-Medium light infestation, 5–Light infestation

Table 8. Number and weight of marketable storage roots of the eight sweetpotato genotypes

GENOTYPE	MARKETABLE STORAGE ROOTS	
	Number	Weight (kg/plant)
Darwin OP	17.67[c]	1.48
Kawitan OP	34.33[bc]	1.93
Miracle OP	65.00[a]	5.00
Peke Negro OP	35.67[b]	3.47
Violet OP	37.33[b]	3.15
Wagwag OP	49.33[ab]	4.25
Bengueta (check)	42.00[b]	3.67
Kalbo-oy (check)	38.67[b]	3.40
CV (%)	24.31	40.51

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

significant differences among the sweetpotato genotypes in terms of weight of marketable storage roots. However, high marketable weight was obtained in Miracle OP (5.00 kg.)

Number and Weight of Non-Marketable Storage Roots

As shown in Table 9, significant differences were noted among the eight sweetpotato genotypes in terms of non-marketable storage roots. Violet OP produced the most numerous non-marketable storage roots with a mean of 83.00 as compared to

Kawitan OP (63.67), Peke Negro OP (62.67) and Miracle OP (60.00). In terms of non-marketable weight, results showed no significant differences. Nevertheless, genotype Miracle OP obtained the heaviest weight of non-marketable storage roots.

It was observed that the number of non-marketable storage roots was higher than the number of marketable storage roots and this could be attributed by improper sorting when the marketable storage roots were considered as non-marketable. This could explain the high CV obtained.

Table 9. Number and weight of non-marketable storage roots of the eight sweetpotato genotypes

GENOTYPE	NON-MARKETABLE STORAGE ROOTS	
	Number	Weight (kg/plant)
Darwin OP	40.67^{bc}	0.92
Kawitan OP	63.67^{ab}	1.35
Miracle OP	60.00^{ab}	0.93
Peke Negro OP	83.00^{a}	1.42
Violet OP	37.67^{bc}	1.42
Wagwag OP	42.00^{bc}	0.93
Bengueta (check)	30.33^{c}	0.77
Kalbo-oy (check)	38.67^{b}	0.65
CV (%)	28.93	35.29

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

Storage Root Yield per Plant

Storage root yield per plant did not significantly differ among the eight sweetpotato genotypes (Table 10). Numerically, yield was higher in Miracle OP (5.93 kg) as compared with the other genotypes. Fewer yield was observed on the genotype Darwin OP (2.40 kg). Figure 5 and 6 show the storage roots harvested from the different genotypes.

Sensory Evaluation

Table 11 shows the consistency of boiled storage roots, color of boiled storage roots and sweetness of boiled storage roots of the eight sweetpotato genotypes evaluated.

Table 10. Storage root yield per plant of the eight sweetpotato genotypes

GENOTYPE	STORAGE ROOT YIELD (kg/plant)
Darwin OP	2.40
Kawitan OP	3.28
Miracle OP	5.93
Peke Negro OP	4.88
Violet OP	4.57
Wagwag OP	5.18
Bengueta (check)	4.43
Kalbo-oy (check)	4.05
CV (%)	27.78

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

Fig. 5. Marketable storage roots of the eight sweetpotato genotypes: 1-Kalbo-oy (check), 2-Kawitan OP, 3-Miracle OP, 4-Darwin OP, 5-Wagwag OP, 6-Peke Negro OP, 7-Violet OP and Bengueta (check)

Fig. 6. Storage root yield per plant of the eight sweetpotato genotypes: 1-Kalbo-oy (check) OP; 2-Kawitan OP; 3-Miracle OP; 4-Darwin OP; 5-Wagwag OP; 6-Peke OP; 7-Violet OP, 8-Bengueta (check)

Results showed that the consistency of boiled storage roots of Kawitan OP, Miracle OP, Peke Negro OP and Violet OP were soft; Darwin OP was very soft; Wagwag OP and Bengueta were slightly hard while Kalbo-oy was hard.

Genotypes Darwin OP, Miracle OP, Peke Negro OP, Wagwag OP and Kalbo-oy had grey color of the boiled storage root while genotypes Kawitan OP and Miracle OP showed purple color. Only genotype Bengueta was observed to have a pale orange color.

As for the consistency of boiled storage roots, Kawitan OP, Miracle OP, Peke Negro OP and Violet OP were soft while Darwin OP was very soft as compared to Wagwag OP and Bengueta were slightly hard while Kalbo-oy was hard. Most of the genotypes were slightly sweet (Darwin OP, Kawitan OP, Miracle OP, Violet OP, Wagwag OP and Bengueta except Kalbo-oy that was moderately sweet and Peke Negro OP which was sweet as evaluated by the panelists.

Table 11. Sensory evaluation of boiled storage roots of the eight sweetpotato genotypes

GENOTYPE	CONSISTENCY	COLOR	SWEETNESS
Darwin OP	Very soft	Grey	Slightly sweet
Kawitan OP	Soft	Purple	Slightly sweet
Miracle OP	Soft	Grey	Slightly sweet
Peke Negro OP	Soft	Grey	Sweet
Violet OP	Soft	Purple	Slightly sweet
Wagwag OP	Slightly hard	Grey	Slightly sweet
Bengueta (check)	Slightly hard	Pale orange	Slightly sweet
Kalbo-oy (check)	Hard	Grey	Moderately Sweet

Dry Matter Content

Dry matter content of storage roots of eight sweetpotato genotypes are shown in Table 12. Highly significant differences were noted among the sweetpotato genotypes. Kawitan OP significantly obtained the highest dry matter content of storage roots (33.23%) followed by Peke Negro OP (29.27%) while Miracle OP (20.93%) and Darwin OP (20.23%) gave the lowest dry matter content of storage roots.

Harvest Index

Highly significant differences were observed among the eight sweetpotato genotypes (Table 13). Kawitan (OP) significantly gave the highest harvest index (1.64) as compared to the other genotypes while Darwin OP obtained the lowest harvest index (0.69).

Table 12. Dry matter content of the eight sweetpotato genotypes

GENOTYPE	DRY MATTER CONTENT (%)
Darwin OP	20.23[f]
Kawitan OP	33.23[a]
Miracle OP	20.93[f]
Peke Negro OP	29.27[b]
Violet OP	25.37[d]
Wagwag OP	23.27[e]
Bengueta (check)	22.63[e]
Kalbo-oy (check)	27.20[c]
CV (%)	2.74

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

Table 13. Harvest index of the eight sweetpotato genotypes

GENOTYPE	HARVEST INDEX
Darwin OP	0.69[c]
Kawitan OP	1.64[a]
Miracle OP	0.99[bc]
Peke Negro OP	1.07[bc]
Violet OP	1.18[b]
Wagwag OP	1.10[b]
Bengueta (check)	0.93[bc]
Kalbo-oy (check)	0.92[bc]
CV (%)	19.13

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

Return on Cash Expense

Table 14 shows the return on cash expense of the eight sweetpotato genotypes. Results revealed that most of the sweetpotato genotypes gave a positive ROCE. Miracle OP gave the highest ROCE (61.8%) followed by Wagwag OP (41.36%) while negative ROCE was obtained from Darwin OP and Kawitan OP with a ROCE of –34.55 % and –104.55% respectively.

Table 14. Return on cash expense from the eight sweetpotato genotypes

GENOTYPE	TOTAL COST OF PRODUCTION (Php)	TOTAL YIELD (Kg)	GROSS INCOME (Php)	NET INCOME (Php)	ROCE (%)
Darwin OP	110	7.20	72.00	-38.00	-34.55
Kawitan OP	110	9.85	98.50	-115.00	-104.55
Miracle OP	110	17.80	178.00	68.00	61.82
Peke Negro OP	110	14.65	146.50	36.50	33.18
Violet OP	110	13.70	137.00	27.00	24.55
Wagwag OP	110	15.55	155.50	45.50	41.36
Bengueta (check)	110	13.30	133.00	23.00	20.91
Kalbo-oy (check)	110	12.15	121.50	11.50	10.45

*Total expenses includes tools and fertilizer used; selling price (10.00/kilo)

SUMMARY, CONCLUSIONS AND RECOMMENDATION

Summary

The study was conducted at Poblacion, Kibungan, Benguet from October 2007-April 2008 to determine the agronomic characters of open-pollinated sweetpotato genotypes and; to determine the sweetpotato genotypes adapted in the locality.

Eight (8) sweetpotato genotypes were characterized and evaluated. The eight sweet potato genotypes have varied leaf, stem and storage root characters. Most of the sweetpotato genotypes were spreading except for Bengueta that was extremely spreading and Miracle OP that was semi-erect.

No significant differences were noted on the weight of marketable storage roots, weight of non-marketable storage roots and average storage root yield. However, numerically, Miracle OP produced the heaviest weight of marketable storage roots and average storage roots while Peke Negro OP and Violet OP produced the heaviest weight of non-marketable storage roots. In terms of the number of non-marketable storage roots, mature leaf size, and petiole length of the eight sweetpotato genotypes, significant differences were observed. Violet OP significantly had the highest number of non-marketable storage roots comparable to Kawitan OP, Miracle OP and Peke Negro OP. Darwin OP produced the least number of non-marketable storage roots. For the mature leaf size and petiole length, Wagwag OP significantly had the largest leaf comparable to Miracle OP and Violet OP while Kalbo-oy had the longest petiole comparable to Miracle OP and Bengueta. Smallest leaf and shortest petiole was observed from Darwin OP.

Results also showed highly significant differences among the eight sweetpotato genotypes in terms of plant survival, plant vigor, number of marketable storage roots, dry

matter content, harvest index, vine length and vine diameter. In terms of plant vigor, Miracle OP, Peke Negro OP and Bengueta were highly vigorous while Darwin OP was least vigorous at 60 DAP. At 90 DAP, most of the sweetpotato genotypes were highly vigorous except for Darwin OP which was the least vigorous. Miracle OP gave the highest number of marketable storage roots while Darwin OP produced the least number of marketable storage roots. Kawitan OP has high dry matter content and harvest index among the eight sweetpotato genotypes.

Most of the sweetpotato genotypes were highly resistant to scab disease except for Darwin OP.

On the sensory evaluation of boiled storage roots, the color and consistency of boiled storage roots varied while for the sweetness of boiled storage roots, Peke Negro OP was rated as the sweetest, Kalbo-oy as moderately sweet and the rest were slightly sweet. Most of the sweetpotato genotypes showed positive ROCE.

Conclusions

Sweetpotato genotypes differed in their morphological characters.

Based on storage root yield, ROCE resistance to scab disease and vigor, Miracle OP, Peke Negro OP, Violet OP, Wagwag OP, Bengueta and Kalbo-oy are adapted at Poblacion, Kibungan, Benguet and can be grown profitably.

Recommendation

Miracle OP, Peke Negro OP, Violet OP, Wagwag OP are recommended at Poblacion, Kibungan, Benguet. Characterization of sweetpotato germplasm should be a continuing activity.

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APPENDICES

APPENDIX TABLE 1. Percentage survival (%) at 30 days after planting (DAP)

GENOTYPE	BLOCK			TOTAL	MEAN
	I	II	III		
Darwin OP	100.00	100.00	86.67	286.67	95.56
Kawitan OP	86.67	86.67	86.67	260.01	86.67
Miracle OP	96.67	96.67	93.33	286.67	95.56
Peke Negro OP	100.00	100.00	100.00	300.00	100.00
Violet OP	100.00	96.67	96.67	293.34	97.78
Wagwag OP	96.67	93.33	100.00	290.00	96.67
Bengueta (check)	100.00	100.00	100.00	300.00	100.00
Kalbo-oy (check)	100.00	100.00	100.00	300.00	100.00
TOTAL	780.01	773.34	763.34	2316.69	96.53

ANALYSIS OF VARIANCE

SOURCE OF VARIATION	DEGREES OF FREEDOM	SUM OF SQUARES	MEAN OF SQUARES	COMPUTED F	TABULAR F	
					0.05	0.01
Treatment	7	410.4547	58.6364	5.95**	2.76	4.28
Block	2	17.5991	8.7995			
Error	14	137.9343	9.8525			
TOTAL	23	565.9881				

** - highly significant

Coefficient of Variation – 3.25%
Standard Error of the Mean – 1.81

APPENDIX TABLE 2. Plant vigor at 60 days after planting (DAP)

GENOTYPE	BLOCK			TOTAL	MEAN
	I	II	III		
Darwin OP	2.00	3.00	4.00	9.00	3.00
Kawitan OP	3.00	4.00	4.00	11.00	3.67
Miracle OP	5.00	5.00	5.00	15.00	5.00
Peke Negro OP	4.00	5.00	4.00	13.00	4.33
Violet OP	5.00	5.00	5.00	15.00	5.00
Wagwag OP	4.00	5.00	5.00	14.00	4.67
Bengueta (check)	5.00	5.00	5.00	15.00	5.00
Kalbo-oy (check)	3.00	4.00	4.00	11.00	3.67
TOTAL	31.00	36.00	36.00	103.00	4.29

ANALYSIS OF VARIANCE

SOURCE OF VARIATION	DEGREES OF FREEDOM	SUM OF SQUARES	MEAN OF SQUARES	COMPUTED F	TABULAR F	
					0.05	0.01
Treatment	7	12.2917	1.7560	9.52**	2.76	4.28
Block	2	2.0833	1.0417			
Error	14	2.5833	0.1845			
TOTAL	23	16.9583				

** - highly significant

Coefficient of Variation – 10.01%
Standard Error of the Mean – 0.2480

APPENDIX TABLE 3. Plant vigor at 90 days after planting (DAP)

GENOTYPE	BLOCK			TOTAL	MEAN
	I	II	III		
Darwin OP	3.00	4.00	4.00	11.00	3.67
Kawitan OP	4.00	4.00	4.00	12.00	4.00
Miracle OP	5.00	5.00	5.00	15.00	5.00
Peke Negro OP	5.00	5.00	5.00	15.00	5.00
Violet OP	5.00	5.00	5.00	15.00	5.00
Wagwag OP	5.00	5.00	5.00	15.00	5.00
Bengueta (check)	5.00	5.00	5.00	15.00	5.00
Kalbo-oy (check)	5.00	5.00	4.00	14.00	4.67
TOTAL	37.00	38.00	37.00	112.00	4.67

ANALYSIS OF VARIANCE

SOURCE OF VARIATION	DEGREES OF FREEDOM	SUM OF SQUARES	MEAN OF SQUARES	COMPUTED F	TABULAR F	
					0.05	0.01
Treatment	7	6.0000	0.8571	9.60**	2.76	4.28
Block	2	0.0833	0.0417			
Error	14	1.2500				
TOTAL	23	7.3333				

** - highly significant

Coefficient of Variation – 6.40%
Standard Error of the Mean – 0.1725

APPENDIX TABLE 4. Mature leaf size (cm)

GENOTYPE	BLOCK			TOTAL	MEAN
	I	II	III		
Darwin OP	7.83	7.83	9.63	25.29	8.43[c]
Kawitan OP	8.37	8.63	10.50	27.50	9.17[bc]
Miracle OP	10.00	9.50	11.57	31.07	10.36[ab]
Peke Negro OP	9.77	10.20	9.40	29.37	9.79[abc]
Violet OP	10.13	9.67	10.77	30.57	10.19[ab]
Wagwag OP	9.87	10.93	12.57	33.37	11.12[a]
Bengueta (check)	10.40	8.73	9.73	28.86	9.62[bc]
Kalbo-oy (check)	9.17	8.83	8.90	26.90	8.97[bc]
TOTAL	75.54	74.32	83.07	232.93	9.71

ANALYSIS OF VARIANCE

SOURCE OF VARIATION	DEGREES OF FREEDOM	SUM OF SQUARES	MEAN OF SQUARES	COMPUTED F	TABULAR F 0.05	TABULAR F 0.01
Treatment	7	15.4397	2.2057	4.02*	2.76	4.28
Block	2	5.6147	2.8073			
Error	14	7.6882	0.5492			
TOTAL	23	28.7426				

* - significant

Coefficient of Variation – 7.64%
Standard Error of the Mean – 0.4278

APPENDIX TABLE 5. Petiole length (cm)

GENOTYPE	BLOCK			TOTAL	MEAN
	I	II	III		
Darwin OP	8.60	7.10	8.13	23.83	7.94
Kawitan OP	10.00	8.83	11.77	30.60	10.20
Miracle OP	9.73	10.53	13.90	34.16	11.39
Peke Negro OP	9.67	9.63	9.77	29.07	9.69
Violet OP	11.50	8.27	11.10	30.87	10.29
Wagwag OP	10.86	10.27	11.63	32.76	10.92
Bengueta (check)	11.80	9.90	8.80	30.50	10.17
Kalbo-oy (check)	12.33	13.23	11.53	37.09	12.36
TOTAL	84.49	77.76	86.63	248.88	10.37

ANALYSIS OF VARIANCE

SOURCE OF VARIATION	DEGREES OF FREEDOM	SUM OF SQUARES	MEAN OF SQUARES	COMPUTED F	TABULAR F	
					0.05	0.01
Treatment	7	35.2117	5.0302	3.04*	2.76	4.28
Block	2	5.3562	2.6781			
Error	14	23.1926	1.6566			
TOTAL	23	63.7605				

* - significant

Coefficient of Variation –12.41%
Standard Error of the Mean – 0.7431

APPENDIX TABLE 6. Vine length (cm)

GENOTYPE	BLOCK			TOTAL	MEAN
	I	II	III		
Darwin OP	1.96	2.70	2.17	6.83	2.28[b]
Kawitan OP	2.30	2.10	2.20	6.60	2.20[b]
Miracle OP	2.00	2.33	2.50	6.83	2.28[b]
Peke Negro OP	2.37	2.30	2.50	7.17	2.39[b]
Violet OP	2.67	2.17	2.63	7.47	2.49[b]
Wagwag OP	2.43	2.03	2.13	6.59	2.20[b]
Bengueta (check)	3.93	3.33	3.80	11.06	3.69[a]
Kalbo-oy (check)	2.63	2.17	2.70	7.50	2.50[b]
TOTAL	20.29	19.13	20.63	60.05	2.50

ANALYSIS OF VARIANCE

SOURCE OF VARIATION	DEGREES OF FREEDOM	SUM OF SQUARES	MEAN OF SQUARES	COMPUTED F	TABULAR F	
					0.05	0.01
Treatment	7	5.1063	0.7295	11.20**	2.76	4.28
Block	2	0.1546	0.0773			
Error	14	0.9122	0.0652			
TOTAL	23	6.1732				

** - highly significant

Coefficient of Variation –10.20%
Standard Error of the Mean – 0.1474

APPENDIX TABLE 7. Vine diameter (mm)

GENOTYPE	BLOCK			TOTAL	MEAN
	I	II	III		
Darwin OP	3.00	3.33	4.00	10.33	3.44[c]
Kawitan OP	3.00	2.00	3.00	8.00	2.67[d]
Miracle OP	5.00	5.00	5.33	15.33	5.11
Peke Negro OP	3.67	4.00	3.00	10.67	3.56[c]
Violet OP	4.00	4.33	4.00	12.33	4.11[bc]
Wagwag OP	3.67	4.00	4.00	11.67	3.89[bc]
Bengueta (check)	4.33	4.00	4.00	12.33	4.11[bc]
Kalbo-oy (check)	4.33	4.67	4.00	11.67	4.33[b]
TOTAL	31.00	31.33	31.33	93.66	3.90

ANALYSIS OF VARIANCE

SOURCE OF VARIATION	DEGREES OF FREEDOM	SUM OF SQUARES	MEAN OF SQUARES	COMPUTED F	TABULAR F	
					0.05	0.01
Treatment	7	10.7630	1.5376	9.74**	2.76	4.28
Block	2	0.0091	0.0045			
Error	14	2.2110	0.1579			
TOTAL	23	12.9831				

** - highly significant

Coefficient of Variation –10.18%
Standard Error of the Mean – 0.2294

APPENDIX TABLE 8. Number of marketable storage roots (kg)

GENOTYPE	BLOCK			TOTAL	MEAN
	I	II	III		
Darwin OP	9.00	11.00	33.00	53.00	17.67
Kawitan OP	19.00	32.00	52.00	103.00	34.33
Miracle OP	54.00	59.00	82.00	195.00	65.00
Peke Negro OP	33.00	45.00	29.00	107.00	35.67
Violet OP	31.00	28.00	53.00	112.00	37.33
Wagwag OP	45.00	42.00	61.00	148.00	49.33
Bengueta (check)	46.00	39.00	41.00	126.00	42.00
Kalbo-oy (check)	34.00	47.00	35.00	116.00	38.67
TOTAL	271.00	303.00	386.00	960.00	40.00

ANALYSIS OF VARIANCE

SOURCE OF VARIATION	DEGREES OF FREEDOM	SUM OF SQUARES	MEAN OF SQUARES	COMPUTED F	TABULAR F	
					0.05	0.01
Treatment	7	3824.0000	546.2857	5.78**	2.76	4.28
Block	2	880.7500	440.3750			
Error	14	1323.2500	94.5179			
TOTAL	23	6028.0000				

** - highly significant

Coefficient of Variation - 24.31%
Standard Error of the Mean – 5.6130

APPENDIX TABLE 9. Weight of marketable storage roots (kg)

GENOTYPE	BLOCK			TOTAL	MEAN
	I	II	III		
Darwin OP	0.35	0.50	3.60	4.45	1.48
Kawitan OP	0.95	1.85	3.00	5.80	1.93
Miracle OP	3.20	4.10	7.70	15.00	5.00
Peke Negro OP	3.00	5.10	2.30	10.40	3.47
Violet OP	1.90	2.40	5.15	9.45	3.15
Wagwag OP	2.70	3.95	6.10	12.75	4.25
Bengueta (check)	3.50	2.90	4.60	11.00	3.67
Kalbo-oy (check)	2.95	4.90	2.35	10.20	3.40
TOTAL	18.55	25.70	34.80	79.05	3.29

ANALYSIS OF VARIANCE

SOURCE OF VARIATION	DEGREES OF FREEDOM	SUM OF SQUARES	MEAN OF SQUARES	COMPUTED F	TABULAR F	
					0.05	0.01
Treatment	7	27.4649	3.9236	2.20^{ns}	2.76	4.28
Block	2	16.5831	8.2916			
Error	14	24.9285	1.7806			
TOTAL	23	24.9285				

ns – not significant

Coefficient of Variation – 40.51%
Standard Error of the Mean – 0.77

APPENDIX TABLE 10. Number of non-marketable storage roots (kg)

GENOTYPE	BLOCK			TOTAL	MEAN
	I	II	III		
Darwin OP	48.00	45.00	29.00	122.00	40.67
Kawitan OP	54.00	62.00	75.00	191.00	63.67
Miracle OP	76.00	34.00	70.00	180.00	60.00
Peke Negro OP	64.00	30.00	94.00	188.00	62.67
Violet OP	86.00	78.00	85.00	249.00	83.00
Wagwag OP	21.00	44.00	48.00	113.00	37.67
Bengueta (check)	42.00	37.00	47.00	126.00	42.00
Kalbo-oy (check)	31.00	11.00	49.00	91.00	30.33
TOTAL	422.00	341.00	497.00	1260.00	52.50

ANALYSIS OF VARIANCE

SOURCE OF VARIATION	DEGREES OF FREEDOM	SUM OF SQUARES	MEAN OF SQUARES	COMPUTED F	TABULAR F	
					0.05	0.01
Treatment	7	6528.6667	932.6667	4.04*	2.76	4.28
Block	2	1521.7500	760.8750			
Error	14	3229.5833	230.6845			
TOTAL	23	11280.0000				

* - significant

Coefficient of Variation – 28.93%
Standard Error of the Mean – 8.7690

APPENDIX TABLE 11. Weight of non-marketable storage roots (kg)

GENOTYPE	BLOCK			TOTAL	MEAN
	I	II	III		
Darwin OP	0.70	1.10	0.95	2.75	0.92
Kawitan OP	0.90	1.00	2.15	4.05	1.35
Miracle OP	0.80	0.80	1.20	2.80	0.93
Peke Negro OP	0.95	0.85	2.45	4.25	1.42
Violet OP	1.25	1.40	1.60	4.25	1.42
Wagwag OP	0.40	1.25	1.15	2.80	0.93
Bengueta (check)	0.70	0.65	0.95	2.30	0.77
Kalbo-oy (check)	0.85	0.25	0.85	1.95	0.65
TOTAL	6.55	7.30	11.30	25.15	1.05

ANALYSIS OF VARIANCE

SOURCE OF VARIATION	DEGREES OF FREEDOM	SUM OF SQUARES	MEAN OF SQUARES	COMPUTED F	TABULAR F	
					0.05	0.01
Treatment	7	1.9324	0.2761	2.02^{ns}	2.76	4.28
Block	2	1.6302	0.8151			
Error	14	1.9148	0.1368			
TOTAL	23	5.4774				

ns - not significant

Coefficient of Variation – 35.29%
Standard Error of the Mean – 0.21

APPENDIX TABLE 12. Storage root yield per plant (kg)

GENOTYPE	BLOCK			TOTAL	MEAN
	I	II	III		
Darwin OP	1.05	1.60	4.55	7.20	2.40
Kawitan OP	1.85	2.85	5.15	9.85	3.28
Miracle OP	4.00	4.90	8.90	17.80	5.93
Peke Negro OP	3.95	5.95	4.75	14.65	4.88
Violet OP	3.15	3.80	6.75	13.70	4.57
Wagwag OP	3.10	5.20	7.25	15.55	5.18
Bengueta (check)	4.20	3.55	5.55	13.30	4.43
Kalbo-oy (check)	3.80	5.15	3.20	12.15	4.05
TOTAL	25.10	33.00	46.10	104.20	4.34

ANALYSIS OF VARIANCE

SOURCE OF VARIATION	DEGREES OF FREEDOM	SUM OF SQUARES	MEAN OF SQUARES	COMPUTED F	TABULAR F	
					0.05	0.01
Treatment	7	25.7083	3.6726	2.52^{ns}	2.76	4.28
Block	2	28.1258	14.0629			
Error	14	20.36923	1.4549			
TOTAL	23	74.2033				

ns – not significant

Coefficient of Variation – 27.78%
Standard Error of the Mean – 0.69

APPENDIX TABLE 13. Dry matter content (%)

GENOTYPE	BLOCK			TOTAL	MEAN
	I	II	III		
Darwin OP	20.60	19.60	20.50	60.70	20.23
Kawitan Op	34.90	32.80	32.00	99.70	33.23
Miracle OP	20.80	21.10	20.90	62.80	20.93
Peke Negro OP	29.60	28.90	29.30	87.80	29.27
Violet OP	25.90	24.90	25.30	76.10	25.37
Wagwag OP	23.50	22.50	23.80	69.80	23.27
Bengueta (check)	24.10	21.90	21.90	67.90	22.63
Kalbo-oy (check)	27.80	27.60	26.20	81.60	27.20
TOTAL	207.20	199.30	199.90	606.4	25.27

ANALYSIS OF VARIANCE

SOURCE OF VARIATION	DEGREES OF FREEDOM	SUM OF SQUARES	MEAN OF SQUARES	COMPUTED F	TABULAR F	
					0.05	0.01
Treatment	7	414.7867	59.2552	123.25**	2.76	4.28
Block	2	4.8358	2.4179			
Error	14	6.7308	0.4808			
TOTAL	23	426.3533				

** - highly significant

Coefficient of Variation – 2.74%
Standard Error of the Mean – 0.40

APPENDIX TABLE 14. Harvest index

GENOTYPE	BLOCK			TOTAL	MEAN
	I	II	III		
Darwin OP	1.02	0.02	1.03	2.07	0.69
Kawitan OP	1.74	1.56	1.61	4.91	1.64
Miracle OP	0.99	0.95	1.03	2.97	0.99
Peke Negro OP	1.05	1.08	1.08	3.21	1.07
Violet OP	1.20	1.17	1.17	3.54	1.18
Wagwag OP	1.09	1.09	1.12	3.30	1.10
Bengueta (check)	0.99	0.88	0.91	2.78	0.93
Kalbo-oy (check)	0.91	0.95	0.89	2.75	0.92
TOTAL	8.99	7.70	8.84	25.53	1.06

ANALYSIS OF VARIANCE

SOURCE OF VARIATION	DEGREES OF FREEDOM	SUM OF SQUARES	MEAN OF SQUARES	COMPUTED F	TABULAR F	
					0.05	0.01
Treatment	7	1.5860	0.2266	5.47**	2.76	4.28
Block	2	0.1244	0.0622			
Error	14	0.5796	0.0414			
TOTAL	23	2.2900				

** - highly significant

Coefficient of Variation – 19.13%
Standard Error of the Mean – 0.12

APPENDIX TABLE 15. Reaction to scab disease at 90 days after planting (DAP)

GENOTYPE	BLOCK			TOTAL	MEAN
	I	II	III		
Darwin OP	5.00	2.00	1.00	8.00	2.67
Kawitan OP	1.00	1.00	1.00	3.00	1.00
Miracle OP	1.00	1.00	1.00	3.00	1.00
Peke Negro OP	1.00	1.00	1.00	3.00	1.00
Violet OP	1.00	1.00	1.00	3.00	1.00
Wagwag OP	1.00	1.00	1.00	3.00	1.00
Bengueta (check)	1.00	1.00	1.00	3.00	1.00
Kalbo-oy (check)	1.00	1.00	2.00	4.00	1.33
TOTAL	12.00	9.00	9.00	30.00	1.25

APPENDIX TABLE 16. Reaction to scab disease at 120 days after planting (DAP)

GENOTYPE	BLOCK			TOTAL	MEAN
	I	II	III		
Darwin OP	7.00	2.00	1.00	10.00	3.332.67
Kawitan OP	1.00	1.00	1.00	3.00	1.00
Miracle OP	1.00	1.00	1.00	3.00	1.00
Peke Negro OP	1.00	1.00	1.00	3.00	1.00
Violet OP	1.00	1.00	1.00	3.00	1.00
Wagwag OP	1.00	1.00	1.00	3.00	1.00
Bengueta (check)	1.00	1.00	1.00	3.00	1.00
Kalbo-oy (check)	1.00	1.00	5.00	7.00	2.33
TOTAL	14.00	9.00	12.00	35.00	1.46

APPENDIX TABLE 17. Reaction to beetle at 90 days after planting (DAP)

GENOTYPE	BLOCK			TOTAL	MEAN
	I	II	III		
Darwin OP	5.00	5.00	5.00	15.00	5.00
Kawitan OP	5.00	5.00	4.00	14.00	4.67
Miracle OP	5.00	5.00	5.00	15.00	5.00
Peke Negro OP	5.00	5.00	5.00	15.00	5.00
Violet OP	5.00	5.00	5.00	15.00	5.00
Wagwag OP	5.00	5.00	5.00	15.00	5.00
Bengueta (check)	5.00	5.00	4.00	14.00	4.67
Kalbo-oy (check)	4.00	5.00	5.00	14.00	4.67
TOTAL	39.00	40.00	38.00	117.00	4.88

APPENDIX TABLE 18. Reaction to beetle at 120 days after planting (DAP)

GENOTYPE	BLOCK			TOTAL	MEAN
	I	II	III		
Darwin OP	5.00	5.00	4.00	14.00	4.67
Kawitan OP	4.00	5.00	4.00	13.00	4.33
Miracle OP	5.00	5.00	5.00	15.00	5.00
Peke Negro OP	5.00	5.00	5.00	15.00	5.00
Violet OP	4.00	5.00	4.00	13.00	4.33
Wagwag OP	5.00	5.00	5.00	15.00	5.00
Bengueta (check)	4.00	5.00	3.00	12.00	4.00
Kalbo-oy (check)	4.00	5.00	4.00	13.00	4.33
TOTAL	36.00	40.00	34.00	110.00	4.58

APPENDIX TABLE 19. Sensory evaluation sheet for the boiled storage roots

Name :_____

Rate the boiled storage roots according to the given scales:

GENOTYPE	CONSISTENCY OF BOILED STORAGE ROOTS	COLOR OF BOILED STORAGE ROOTS	SWEETNESS OF BOILED STORAGE ROOTS
	1 – Watery 2 – Extremely soft 3 – Very soft 4 – Soft 5 – Slightly hard 6 – Moderately hard 7 – Hard 8 – Very hard 9 – Very hard and not cooked	1 – Some beige 2 – Much beige 3 – Slightly green or grey 4 – Green 5 – Grey 6 – Beige and green 7 – Beige and grey 8 – Beige and purple 9 - Purple	1 – Bland 2 - Slightly sweet 3 – Moderately sweet 4 – Sweet 5-Very sweet
Darwin OP			
Kawitan OP			
Miracle OP			
Peke Negro OP			
Violet OP			
Wagwag OP			
Bengueta (check)			
Kalbo-oy (check)			