BIBLIOGRAPHY

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ABSTRACT

The study aimed to determine the effect of different locations on the chipping quality of potato accessions; identify the potato accessions with the best chipping quality, and determine the interaction between location and potato accession.

Potatoes grown in Balili and Longlong had the highest chip recovery and produced light yellow chips with moderate browning. The chips produced were also crispy, slightly oily, and were liked much by the panelists.

Accessions 676089 and 5.19.2.2 have good chipping quality due to their high dry matter contents and high chip recovery. Both accessions also produced yellow and crispy chips which were liked much by the panelists.

Growing accessions 676089 and 5.19.2.2 in either Balili or Longlong is recommended for organic production of potatoes suitable for chipping.

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INTRODUCTION

Processed potato products such as chips and fries are increasing in demand throughout the world because of the changing lifestyle and eating habits of people (APA, 1991).

Businesses like fast food chains and other food factories are now expanding in producing potato snacks like potato chips, french fries, powder, and other potato based snack foods. In fact, the demand for potato chips is increasing and production capacity is expanding from 20 metric tons to an estimated 80 metric tons per day which is equivalent to a daily demand of 400 to 533 metric tons of fresh potatoes (BPRE, 1997). However, this increasing demand for processed potatoes cannot be met by local produces.

Potato varieties which are commonly grown in Benguet are also not suitable for processing. For instance, Granola which is commonly grown by farmers is not good for processing because of its high sugar content and low dry matter content (FRLD, 1995). Nevertheless, due to its availability and high yield, processors utilize the variety for chip and french fry.

A processing variety must have high dry matter and low sugar content. Such varieties often have higher chip yield, crispy and slightly oily chips (Ludwig, 1985). However, potato varieties suitable for processing are often low yielding and thus, not planted by farmers. Evaluation of processing potato varieties is therefore important.

In addition, organically grown potatoes may add value to the processed potato. Such potatoes have higher vitamin C, iron, magnesium, etc. when compared to conventionally grown crops. It also contains no carcinogenic pesticides (Ouchterlony, 2006).

Environmental conditions in a production site might also influence the chipping quality of potato varieties.

Thus, selection of potato accessions that are suitable for chipping and organically grown in several locations is important.

The study was conducted to:

1. determine the effect of locations on the chipping quality of different potato accessions;

2. identify the potato accessions with the best chipping quality; and

3. determine the interaction between location and potato accession.

The study was conducted at the Department of Agronomy Laboratory, College of Agriculture from February to March 2007.

REVIEW OF LITERATURE

Nutritional Aspects of Potato

Potato is approximately 80 % water, 17 % carbohydrates, 2 % protein in its raw and cooked states. As a consequence, energy content of raw potato is less than that of raw cereals and legumes (Arntzen, 1994).

A medium-sized, boiled, unpeeled potato contains 120 calories, 13 g of protein, 27 g carbohydrates, a trace amount of fat, 16 mg of calcium, 1 mg iron, 22 mg Vitamin C and niacin. The consumption of 5 pounds (2.2 kg) of potato per day plus a quart (0.9 l) of milk provide all the nutrients essential for the human diet (Picpican and Balaoing, 2005).

Important Characteristics for the Processing Potato

APA (1991) stated that the processing of french fries is given to potatoes with a dry matter content of 20-24 %. Higher or lower than that may have a negative result on the quality. For the production of chips, a dry matter content of 22-24 % is required. Dry matter is strongly related to the variety. For the reducing sugars, the lower the reducing sugar content, the better the quality of the product. For the Processing Industry, accepted values are 0.2 % for chips and 0.5 % for french fries. Furthermore, varieties showing discoloration are not suitable for the processing industry.

High sugar content of potatoes and sweet potatoes causes chips to turn dark brown and give a burnt flavor when deep-fat fried (Villareal and Griggs, 1982).

Ludwig (1985) mentioned that the sugar content of potato for chipping should be below 2 %. Potatoes of low sugar content result in lighter colored chips. He also added that potatoes for processing depends on its dry matter content. The dry matter content

that are acceptable for chip processing ranges from 17.19 % to 22.99 %, while the least acceptable are those with 15.10 % to 16.44 % dry matter content.

Potatoes with a low reducing sugar content give acceptable golden yellow chips (Talburt, 1975). Sugars participate in the browning reaction but other constituents of potato such as the amino acid, ascorbic acid and other organic components must be present before color formation occurs. Researchers like Smith (1977) and Treadway (1960) found that soluble and insoluble protein fractions appear to have no effect on browning of potato.

Improving Color of Potato Chips

It is almost impossible on many occasions for the processors to make light colored chips acceptable to the trade without some treatments of the slices in the chip plant. Many researchers had their own ways in proving and getting the desired color of the chips. Some extracted browning reactants from slices in hot aqueous solutions of alkaline earth salts, others treated slices in hot solution of sodium bisulfite or a combination of sodium bisulfite, citric acid and phosphoric acid. Such treatments may be used to reduce the production of dark colored chips (Smith, 1977).

Chipping Quality of Potatoes

Amonte (1966) stated that most preferred by processors in terms of skin color of potato is yellow. Other important characteristics are shallow eyes, round or elongated tuber shape, smooth skin and freedom from defects. These are important for lesser trimmings, preferred sizes, high chip yield, absence of discoloration or browning during frying and good quality and food safety. Diseased tubers (eg. bacterial wilt) exhibit rings

of brown color when chipped and this is unsafe to eat since it may cause allergic reactions to susceptible individuals.

Environmental Factors Affecting Chipping Quality of Potatoes

Climate, soil and fertilizer application may have a direct effect on the dry matter content of potatoes. Ratstovski and Es Van (1981) stated that high dry matter content of potatoes were obtained from plants sown in silt soil while sandy soil gives the lowest sugar content in potato tubers.

Warn and dry conditions are also favorable to high dry matter content, while wet weather tends to reduce it (Hartel and Heldman, 1998).

MATERIALS AND METHODS

Marketable potato tubers of six potato accessions harvested from six locations of Benguet were used for chipping, all potato accessions originated from Peru. One hundred grams of potato tubers per replication per treatment were processed into chip.

The treatments which were replicated three times were as follows:

Factor A: Location (L)

L_1=Loo

L_2=Englandad

L_3=Balili

L_4=Longlong

L_5=Cabutotan

L_6=Sinipsip

Factor B: Accessions (A)

A_1=96-06

A_2=676089

A_3=573275

A_4=5.19.2.2

A_5=13.1.1

A_6=Ganza

Selected quality tubers were peeled thinly with the use of knife. The tubers were then sliced at 1-2 mm using a potato chipper. The chips were soaked in cold water while chipping to avoid browning and were pat dried using a clean towel. The chips were fried in oil until golden brown and crisp. Finally, the chips were packed in polyethylene bags ready for sensory evaluation (Fig. 1).

Data gathered:

1. Climatic factors. The temperature and relative humidity in each location were taken using compact whirling psychrometer.

2. Dry matter content. This was taken by oven-drying 100 g of sliced potato tubers for 72 hours at 100 °C (Fig. 2). This was computed using the formula:

% Dry matter content = 100 % - % Moisture content

Where:

$$\% \text{ Moisture content} = \frac{\text{Fresh weight} - \text{Oven dry weight}}{\text{Fresh weight}} \text{ X } 100$$

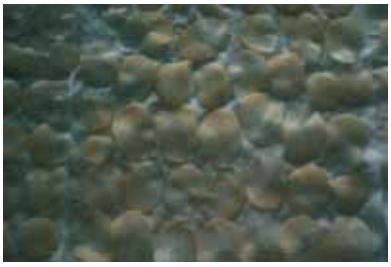
3. Sugar content (° Brix). The juice from 100 g potato tubers of different sizes was extracted using a digital refractometer the sugar content was determined (Fig. 3).

4. Chip recovery. This was taken by weighing raw potato chips and computed using the formula:

$$\text{Chip recovery} = \frac{\text{Weight of chipped tubers}}{\text{Weight of unpeeled tubers}} \text{ X } 100$$

5. Chip color. After frying, the potatoes were evaluated based on the color descriptions prepared by the Potato Chip Institute International (N.D.).

potato chips were soaked while chipping



potato chips were spread on tissue paper

potato chips were dried to lessen soil absorption

frying of potato chips

packing and sealing of chips in polyethylene bags

sensory evaluation of chips by panelists

Fig. 1. Chipping potato tubers

6. Chip browning. This was taken by visually observing the potato chips using the rating scale (Mabesa, 1986):

SCALE	REMARKS	RATE
1	Not browning	6 % browning
2	Slight browning	3-5 % browning
3	Moderate browning	1-2 % browning
4	Severe browning	0 % browning

7. Sensory evaluation. After frying, ten non-smoking panelists aged 13 years and above evaluated the chips using the following parameters (Mabesa, 1986):

a. Crispiness

SCALE	REMARKS
1	Very crispy
2	Crispy
3	Moderately crispy
4	Slightly crispy
5	Not crispy

b. Taste

SCALE	REMARKS
1	Very Perceptible
2	Perceptible
3	Moderately perceptible
4	Slightly perceptible
5	Not perceptible

Fig. 2. Slicing of tubers into cubes for oven drying

Fig. 3. Implements used for determination of sugar content

c. Oil Absorption

SCALE	REMARKS
1	Not oily
2	Slightly oily
3	Moderately oily
4	Oily
5	Very oily

d. Texture

SCALE	REMARKS
1	Firm
2	Moderately firm
3	Slightly firm
4	Not firm

e. Appearance

SCALE	REMARKS
1	Like very much
2	Like much
3	Like moderately
4	Like slightly
5	Dislike/ not like

f. General acceptability

SCALE	REMARKS
1	Like very much
2	Like much
3	Like moderately
4	Like slightly
5	Dislike/ not like

Analysis of Data

All data were analyzed using analysis of variance for 6 x 6 factor factorial in randomized complete block design (RCBD) with three replications. The significance of means was tested using Duncan's Multiple Range Test (DMRT) at 5 % level of significance.

RESULTS AND DISCUSSION

Temperature and Relative Humidity

The temperature and relative humidity from the different locations were taken from November 2006 to February 2007 (Table 1).

Potatoes grow best in temperatures ranging from 17-22 ºC (HARRDEC, 1996). Longlong, Balili and Loo are within the optimum temperature range which maybe favorable for dry matter production.

Relative humidity or the amount of moisture in the air is highest in Englandad (93.8 %) and lowest in Balili (66.4 %). Relative humidity might influence chipping quality of potatoes by causing changes in dry matter of tubers.

Dry Matter Content

Effect of location. No significant differences were observed in the dry matter content of tubers planted in the different locations (Table 2). Potato tubers harvested from in Longlong and Balili produced the highest tuber dry matter content (22.10 % and 22.00 %) while tuber harvested from Englandad produced the lowest (19 %). All the tubers from the different locations are suitable for processing due to their high dry matter contents.

Table 1. Temperature and relative humidity in the different locations

	LOCATION					
	LOO	ENGLANDAD	BALILI	LONGLONG	CABUTOTAN	SINIPSIP
Temperature (°C)	18.21	14.74	19.13	19.57	16.20	14.75
Relative humidity (%)	70.75	93.8	66.4	69.04	77.81	80.4

Effect of accession. There were no significant differences on the dry matter of tubers of six accessions used in the study. The dry matter content of tubers from all the accessions ranged from 19-22 %, thus, meeting the required dry matter content of above 19 % for processing (Kuntz, 1996).

Table 2. Dry matter content of potato tubers from the different accessions grown organically in six locations of Benguet

TREATMENT	DRY MATTER CONTENT (%)
Locations (L)	
Loo	20.80
Englandad	19.00
Balili	22.00
Longlong	22.10
Cabutotan	21.90
Sinipsip	19.80
Accession (A)	
96-06	19.10
676089	22.00
573275	20.00
5.19.2.2	22.10
13.1.1	19.80
Ganza	19.80
L x A	**
CV (%)	9.47

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

Interaction effect. A highly significant interaction is observed between locations and accessions on dry matter content (Figure 4).

Accession 676089 harvested from Longlong gained the highest tuber dry matter content. Dry matter is influenced mainly by the genetic characteristics of the accession but may also be affected by environmental factors (Ratsovski *et al*., 1981). High temperature in a location may cause faster photosynthetic rate resulting to high dry matter production in potatoes.

High dry matter is important for chipping potatoes due to lesser oil uptake, shorter frying time, better texture, and crispiness.

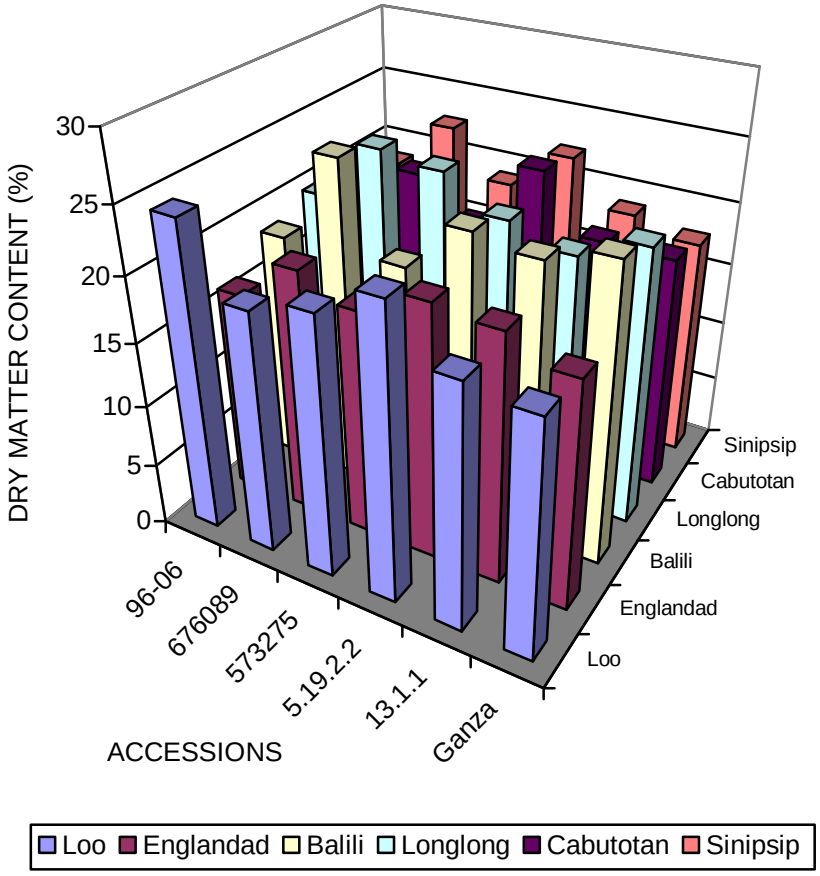


Fig. 4. Dry matter content of potato tubers from the different accessions grown organically in six locations of Benguet

Sugar Content

Effect of location. Highly significant differences are observed in the sugar content of potato tubers harvested in each location (Table 3). The highest sugar content was obtained from tubers harvested at Longlong (7.88 ºBrix) while the lowest sugar content was obtained from tubers harvested from Englandad (5.26 ºBrix). Low sugar content of tubers is preferred for chipping since high sugar content may cause browning in chips during frying (Kumar *et al*., 2004).

High sugar content of tubers in Longlong might be attributed to the high temperature (19.57 ºC) in the site. High temperature may increase photosynthetic rate leading to high production of sugar in the tubers.

Effect of accession. The sugar content of the tubers from the different accessions were not significantly different from each other. The lowest sugar content was obtained from accession 96-06 (5.88 ºBrix) while the highest sugar content was from the tubers 5.19.2.2 (6.29 ºBrix).

Interaction effect. A highly significant interaction was observed in the sugar content of potato tubers from accessions grown in different locations (Figure 5). Tubers of accessions 96-06, 573275 and 5.19.2.2 harvested from Englandad gave the lowest sugar contents (5.20 ºBrix).

Low sugar content is important in tubers to avoid browning during frying (Gould, 1988). Sugar content is a varietal characteristic that maybe influenced by environmental factors in a location (Peet, 2007). Thus, both accession and location must be considered in the selection of potatoes with low sugar content.

Table 3. Sugar content of potato tubers of different accessions grown organically in six locations of Benguet

TREATMENT	SUGAR CONTENT (%)
Locations (L)	
Loo	5.34 [a]
Englandad	5.26 [a]
Balili	6.61 [b]
Longlong	7.38 [c]
Cabutotan	5.44 [a]
Sinipsip	6.57 [b]
Accession (A)	
96-06	5.88
676089	6.09
573275	6.15
5.19.2.2	6.29
13.1.1	6.00
Ganza	6.18
L x A	**
CV (%)	4.79

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

Percent Chip Recovery

Effect of location. High significant differences were observed on the chip recovery of potatoes grown in the different locations (Table 4). Potato tubers harvested from Balili gave the highest percent chip recovery (85.70 %) but comparable with the rest of the locations except Loo and Sinipsip.

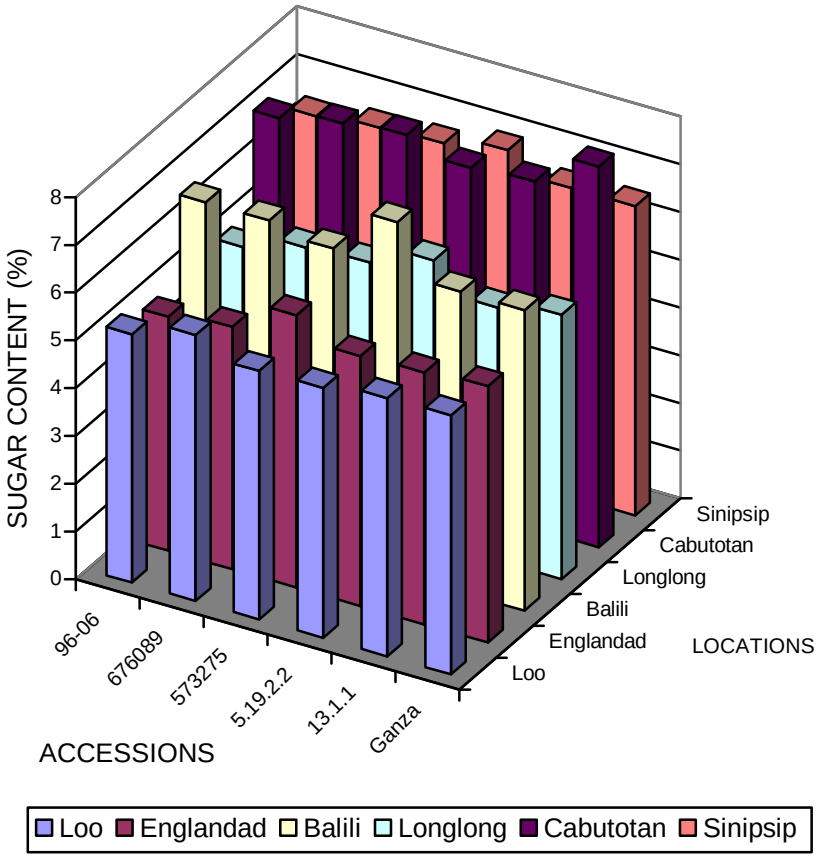


Fig. 5. Sugar content of potato tubers from the different accessions grown organically in six locations of Benguet

Percent chip recovery is influenced by dry matter of tubers. Dry matter is also influenced by environmental conditions in the site. Potato tubers harvested from Balili which had the highest chip recovery also had one of the highest dry matter content.

Effect of accession. Highly significant differences were observed on the percent chip recovery of the tubers harvested from six potato accessions (Fig. 7). Tubers from accession 5.19.2.2 gave the highest percent chip recovery which was comparable with the rest of the accessions except for 13.1.1. Chip yield is correlated to dry matter. The higher the dry matter, the higher the chip yield (Feltran *et al*., 2004). Thus, tubers from accession 5.19.2.2 which had the highest dry matter (22.10 %) also had the highest chip recovery. Fig. 7 shows the tubers of different accessions and chips processed from the tubers.

Interaction effect. A highly significant interaction is observed between locations and accessions on percent chip recovery (Fig. 6). Thus, both location and accession must be considered in selecting for high chip recovery.

Chip Color

Effect of location. Highly significant differences were observed on the chip color of tubers harvested in the different locations. Potato tubers harvested from Loo, Longlong and Balili produced light yellow chips while potato from Englandad, Cabutotan and Sinipsip produced yellow chips (Table 5).

Table 4. Percent chip recovery of potato tubers from the different accessions grown organically in six locations of Benguet

TREATMENT	CHIP RECOVERY (%)
Locations (L)	
Loo	78.20 [b]
Englandad	82.30 [ab]
Balili	85.70 [a]
Longlong	78.60 [ab]
Cabutotan	79.70 [ab]
Sinipsip	67.79 [b]
Accession (A)	
96-06	75.70 [ab]
676089	81.30 [a]
573275	79.60 [ab]
5.19.2.2	84.10 [a]
13.1.1	75.40 [b]
Ganza	79.40 [ab]
L x A	**
CV (%)	28.90

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

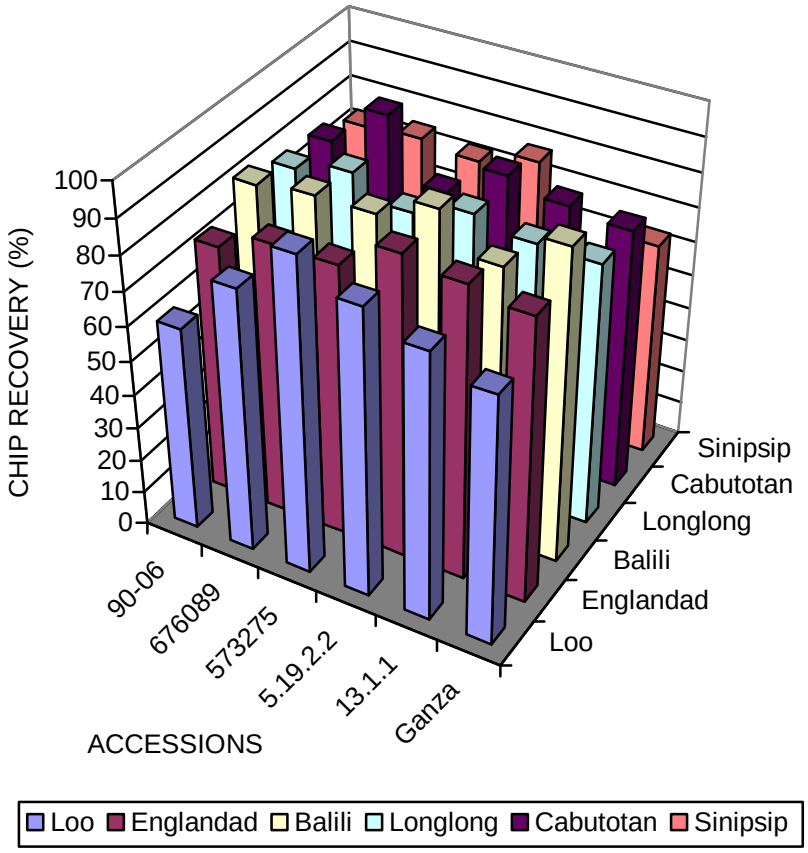
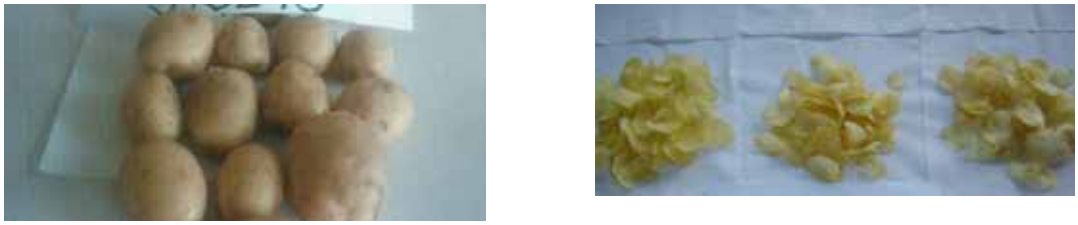


Fig. 6. Chip recovery (%) of potato tubers from different accessions grown organically in six locations of Benguet

TUBERS CHIPS

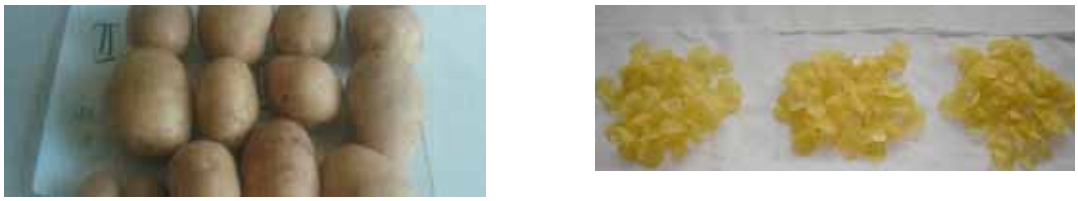


573275

676089

96-06

Ganza



5.19.2.2

13.1.1

Fig. 7. Tubers and chips of the organically grown potato accessions

Chip color could be affected by the sugar content of the tuber, therefore, it is necessary that the sugar content must be low (Kuntz, 1996). However, potato tubers from Longlong which had the highest sugar content still produced light yellow chips. Thus, potato tubers harvested from Longlong might still exhibit optimum sugar content for chipping.

Effect of accession. Chip color of the different tubers from the accessions were highly significant. Tubers of accessions 96-06 and 13.1.1 gave light yellow chips while the rest produced yellow chips (Fig. 9). Light yellow chips processed from tubers of accessions 96-06 and 13.1.1 might be due to low sugar contents (5.88 and 6.00 ºBrix).

Table 5. Chip color of potato tubers from different accessions grown organically in six locations of Benguet

TREATMENT	CHIP COLOR
Locations (L)	
Loo	3.00 a
Englandad	4.00 b
Balili	3.00 a
Longlong	3.00 a
Cabutotan	4.00 b
Sinipsip	4.00 b
Accession (A)	
96-06	3.00 a
676089	4.00 b
573275	4.00 b
5.19.2.2	4.00 b
13.1.1	3.00 a
Ganza	4.00 b
L x A	**
CV (%)	14.49

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

Interaction effect. Statistical analysis revealed that a highly significant interaction exists between the accessions and locations (Fig. 8). Light yellow chips were mostly processed from potato tubers of accessions harvested at Balili and Longlong. Conditions in these sites might have positively influenced tuber sugar content, thus, leading to light colored chips.

Chip Browning

Effect of location. Potato tubers harvested from all locations produced moderately brown chips (Table 6).

Effect of accession. Highly significant differences were observed in the browning of chips processed from the tubers harvested from the different accessions. Tubers of accession 676089 and Ganza gave chips with slight browning while the rest gave moderately brown chips.

Browning of potato chips occurs mainly in the last phase of the frying process. Browning could be affected by the reducing sugar of the tubers (Feltran *et. al.*, 2004). Thus, potato tubers of accession 676089 and Ganza which had one of the lowest sugar contents also produced chips with slight browning.

Interaction effect. A highly significant interaction was observed between locations and accessions on chip browning (Figure 10). Most of the tubers from the accessions grown in all locations produced chips with slight to moderate browning.

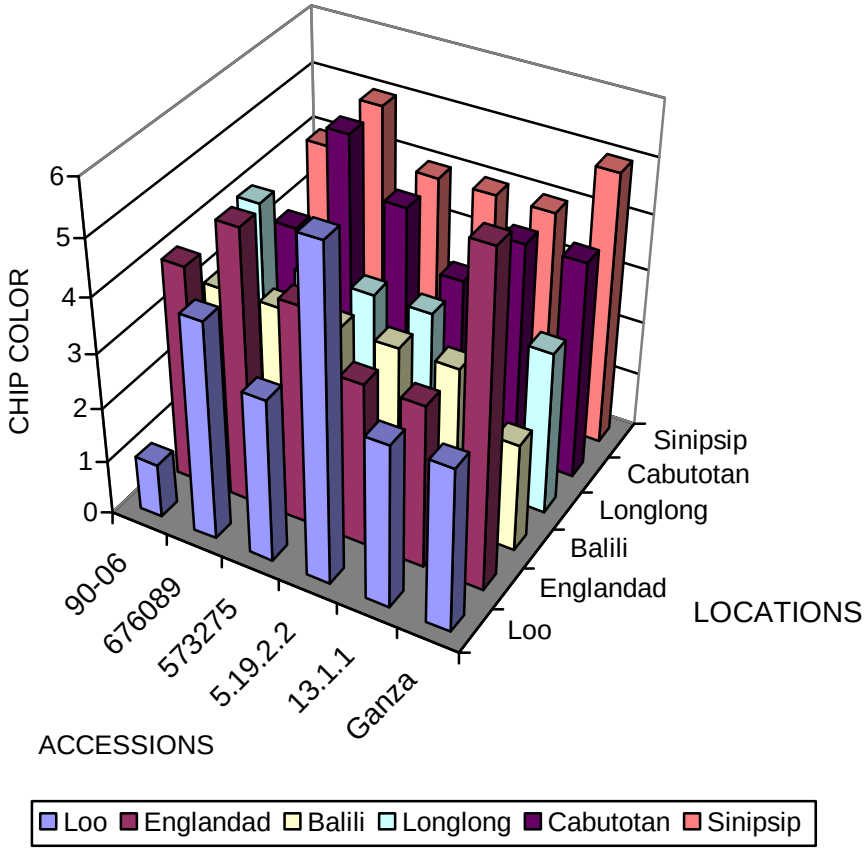


Fig. 8. Chip color of potato tubers of different accessions grown organically in six locations of Benguet

(a)

(b)

Fig. 9. (a) Light yellow chips (rating 3); (b) Yellow chips (rating 4)

Table 6. Chip browning of potato tubers from the different accessions grown organically in six locations of Benguet

TREATMENT	CHIP BROWNING
Locations (L)	
Loo	3.00
Englandad	3.00
Balili	3.00
Longlong	3.00
Cabutotan	3.00
Sinipsip	3.00
Accession (A)	
96-06	3.00 [b]
676089	2.00 [a]
573275	3.00 [b]
5.19.2.2	3.00 [b]
13.1.1	3.00 [b]
Ganza	2.00 [a]
L x A	**
CV (%)	11.45

Means followed by common letters are not significantly different at 5% level of DMRT
1 – No browning; 2 – Slight browning; 3 – Moderate browning; 4 – Severe browning

Sensory Evaluation

Effect of location. The chips produced from the tubers harvested from the different locations were crispy, slightly oily, and firm to moderately firm. Crispiness, oiliness, and texture are influenced by the dry matter content of tubers. High dry matter results to crispiness and less oil absorption in chips (Feltran *et al.*, 2004). Dry matter is in turn influenced by conditions in the site. Thus, conditions in the site might be favorable for producing potatoes for chips.

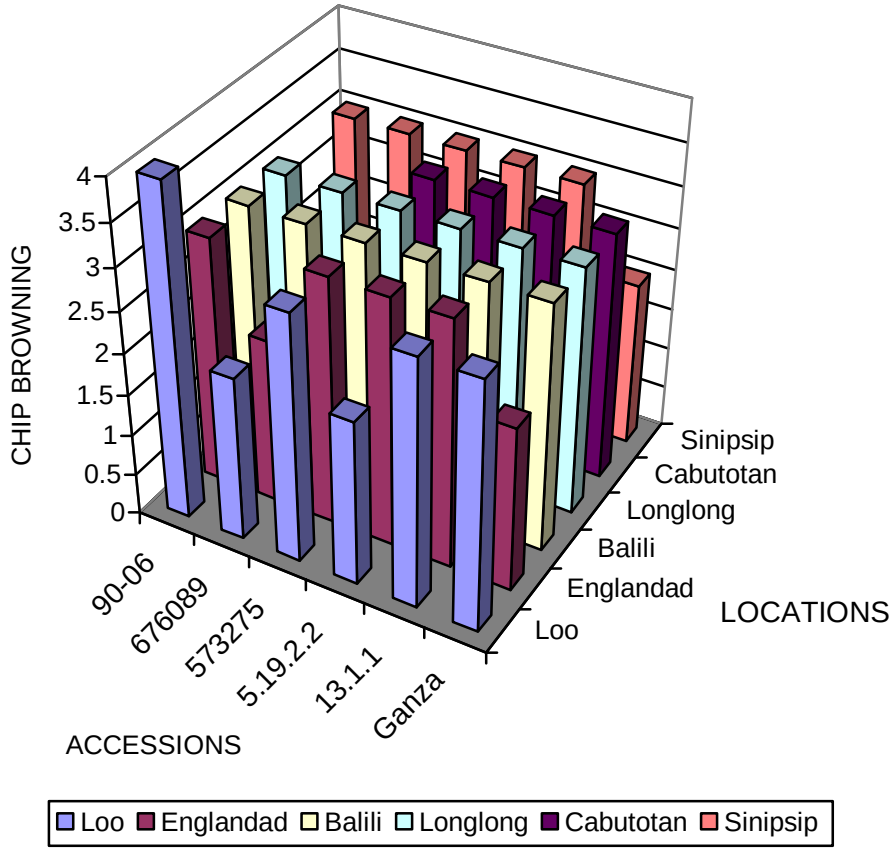


Fig. 10. Chip browning of potato tubers from the different accessions grown organically in six locations of Benguet

The chips also had moderately perceptible to perceptible taste and were liked much by the panelists except chips produced from Cabutotan which were liked moderately.

Effect of accession. The chips produced from the tubers of the different accessions were crispy, slightly oily, and moderately firm. Optimum dry matter contents of the accessions (19-22 %) resulted to crispy chips with less oil absorption.

Moreover, the chips were liked much by the panelists except for chips from 96-06 and Ganza which were liked moderately. Taste and acceptability of chips may be influenced by sugar content of tubers and color of chips.

SUMMARY, CONCLUSION AND RECOMMENDATION

Summary

This study was conducted to; determine the effect of the different locations on chipping quality of tubers from different accessions; identify the potato accessions with the best chipping quality; and to determine the interaction between location and potato accession.

Potato tubers harvested from all locations had dry matter contents of 19 to 22 %. Lowest sugar content, on the other hand, was obtained from potato tubers harvested from Englandad, Loo, and Cabutotan.

Potato tubers from Balili had the highest chip yield but comparable to chips from Englandad, Longlong, and Cabutotan. Chips from Loo, Balili and Longlong were light yellow with moderate browning. Chips from all locations were crispy, slightly oily and were liked much by the panelists except chips from Cabutotan which were liked moderately.

Among the accessions, potato tubers harvested from accessions 5.19.2.2 and 676089 had the highest dry matter content, thus, producing the highest chip recovery. Lowest sugar content was exhibited by tubers from 96-06 and 13.1.1, which also produced light yellow chips with moderate browning.

All the accessions produced chips which were crispy, slightly oily, and liked much by the panelists except Ganza which was liked moderately.

Interaction between locations and accessions were significant in terms of dry matter, sugar content, and chip recovery. Highly significant interaction were also observed on the color and browning of potato chips.

Conclusion

Balili and Longlong are the best sites in growing organic potatoes for chip processing. Potatoes taken from these sites had high chip yield and light yellow chips with moderate browning.

Tubers from accessions 5.19.2.2 and 676089 showed good chip characteristics such as high dry matter and high chip recovery. Both accessions also produced tubers with crispy chips which were liked much by panelists.

Growing accessions 676089 and 5.19.2.2 in either Balili or Longlong might therefore result in the production of tubers with good chip quality.

Recommendation

Based on the results, Balili and Longlong are recommended for producing organic potatoes suitable for chip processing. Accessions 676089 and 5.19.2.2 are also recommended for chip processing due to their high chip yield.

In addition, growing accessions 676089 and 5.19.2.2 organically at Balili or Longlong are recommended for successful production of potatoes suitable for chip processing.

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APPENDICES

APPENDIX TABLE 1. Dry matter content of six accessions grown in six locations

TREATMENT		REPLICATION			TOTAL	MEAN
		I	II	III		
L_1	A_1	25.8	22.7	24.5	73.0	24.3
	A_2	17.4	19.2	19.0	57.6	19.2
	A_3	18.2	23.9	19.5	61.6	20.5
	A_4	22.8	23.2	22.9	68.9	23.0
	A_5	19.1	18.7	19.7	57.5	19.2
	A_6	17.6	19.3	18.9	55.8	18.6
L_2	A_1	18.2	14.9	16.0	49.1	16.4
	A_2	19.4	15.1	24.5	59.0	19.7
	A_3	19.1	19.7	20.2	54.0	18.0
	A_4	20.7	18.9	21.0	60.6	20.2
	A_5	21.2	19.2	18.8	59.2	19.8
	A_6	17.5	20.3	16.4	54.2	18.1
L_3	A_1	15.6	21.0	19.1	55.7	18.6
	A_2	25.1	26.7	25.1	76.9	25.6
	A_3	18.2	18.0	20.5	56.7	18.9
	A_4	19.1	23.3	26.0	68.4	22.8
	A_5	22.0	23.4	20.9	66.3	22.1
	A_6	22.9	23.2	21.4	70.5	23.5
L_4	A_1	20.9	19.3	19.2	50.4	19.8
	A_2	26.3	20.8	26.2	73.3	24.4
	A_3	20.7	22.9	28.0	71.6	23.9
	A_4	21.1	19.9	23.3	64.3	21.4
	A_5	19.9	18.9	21.5	60.3	20.1
	A_6	23.2	18.8	24.1	66.1	22.0
L_5	A_1	17.2	15.3	17.9	50.4	16.8
	A_2	19.3	22.7	20.0	62.0	20.7
	A_3	19.1	17.8	16.3	53.2	17.7
	A_4	21.5	24.2	23.3	69.3	23.1
	A_5	20.2	17.4	18.9	56.5	18.8
	A_6	20.1	17.3	19.0	56.4	18.8
L_6	A_1	17.3	17.0	21.7	56.0	18.7
	A_2	21.3	22.7	23.0	57.8	22.6
	A_3	21.3	20.7	15.0	57.0	19.0
	A_4	21.4	23.3	22.0	66.7	22.2
	A_5	19.7	19.7	17.2	56.9	18.9
	A_6	15.8	18.0	18.1	51.9	17.7

TWO-WAY TABLE

ACCESSIONS	LOCATION SITE						TOTAL	MEAN
	L_1	L_2	L_3	L_4	L_5	L_6		
A_1	24.3	16.4	18.6	19.8	16.8	18.7	114.6	19.1
A_2	19.2	19.7	25.6	24.4	20.7	22.6	132.2	22.0
A_3	20.5	18.0	18.9	23.9	17.7	19.0	118	20.0
A_4	23.0	20.2	22.8	21.4	23.1	22.2	110.5	22.1
A_5	19.2	19.8	22.4	20.1	18.8	18.9	118.9	19.8
A_6	18.6	18.1	23.5	22.0	18.8	17.7	118.7	19.8
TOTAL	124.8	112.1	131.5	131.6	115.9	119.1		
MEAN	20.8	18.7	21.9	21.9	19.3	19.8		

ANALYSIS OF VARIANCE

SOURCE OF VARIATION	DEGREES OF FREEDOM	SUM OF SQUARES	MEAN SQUARE	COMPUTED F	TABULATED F	
					0.05	0.01
Replication	2	10.765	5.375			
Treatment	35	585.892	16.744			
A–Location Site	(5)	158.837	31.767	1.71^{ns}	2.35	3.29
B–Accessions	(5)	147.822	29.564	1.24^{ns}	2.35	3.29
A x B	(25)	279.293	11.172	2.74^{**}	1.66	2.06
Error	70	285.777	4.083			
TOTAL	107	882.425				

** – Highly significant Coefficient of Variation = 9.47 %

ns – Not significant

APPENDIX TABLE 2. Sugar content of six accessions grown in six locations

TREATMENT		REPLICATION			TOTAL	MEAN
		I	II	III		
L_1	A_1	5.2	5.2	5.2	15.6	5.2
	A_2	5.2	6.0	5.5	16.7	5.6
	A_3	5.2	5.1	5.3	15.6	5.2
	A_4	5.2	5.2	5.3	15.7	5.2
	A_5	5.4	5.4	5.4	16.2	5.4
	A_6	5.4	5.6	5.3	16.3	5.4
L_2	A_1	5.1	4.9	4.7	14.7	4.9
	A_2	5.2	5.2	7.8	15.2	5.1
	A_3	5.5	6.0	5.6	17.1	5.7
	A_4	5.2	5.1	5.4	15.87	5.2
	A_5	5.8	4.7	5.3	15.8	5.3
	A_6	5.5	5.2	5.4	16.1	5.4
L_3	A_1	5.8	7.1	7.0	19.9	6.6
	A_2	6.6	6.8	6.5	19.9	6.6
	A_3	6.6	6.4	6.3	19.3	6.4
	A_4	7.6	7.4	7.1	22.1	7.4
	A_5	6.3	6.4	6.2	18.9	6.3
	A_6	6.3	6.3	6.3	18.9	6.3
L_4	A_1	4.9	5.1	5.1	15.1	5.0
	A_2	5.3	5.3	5.6	16.2	5.4
	A_3	5.4	5.5	5.5	16.4	5.5
	A_4	5.5	6.2	6.0	17.7	5.9
	A_5	5.5	5.1	5.3	15.9	5.3
	A_6	5.7	5.6	5.3	16.6	5.5
L_5	A_1	7.1	7.1	7.0	21.2	7.1
	A_2	7.2	7.1	7.7	22.0	7.3
	A_3	7.0	7.5	7.9	22.4	7.5
	A_4	7.4	7.0	7.1	21.5	7.2
	A_5	7.0	7.9	6.9	21.8	7.3
	A_6	7.2	7.9	8.8	23.9	8.0
L_6	A_1	6.5	6.4	6.4	19.3	6.4
	A_2	6.6	6.6	6.5	19.7	6.6
	A_3	6.6	6.8	6.5	19.9	6.6
	A_4	7.0	6.7	6.9	20.6	6.9
	A_5	6.7	6.5	6.2	19.4	6.5
	A_6	6.5	6.4	6.5	19.4	6.5

TWO-WAY TABLE

ACCESSIONS	LOCATION SITE						TOTAL	MEAN
	L_1	L_2	L_3	L_4	L_5	L_6		
A_1	5.2	4.9	6.6	7.1	5.0	6.4	35.8	5.8
A_2	5.6	5.1	6.6	7.3	5.4	6.6	36.6	6.1
A_3	5.2	5.7	6.4	7.5	5.5	6.6	36.9	6.1
A_4	5.2	5.2	7.4	7.2	5.9	6.9	37.8	6.3
A_5	5.4	5.3	6.3	7.3	5.3	6.5	36.1	6.0
A_6	5.4	5.4	6.3	8.0	5.5	6.5	37.1	6.18
TOTAL	32	31.6	39.6	44.4	32.6	6.58	39.5	
MEAN	5.34	5.3	6.6	7.4	5.4	6.58		

ANALYSIS OF VARIANCE

SOURCE OF VARIATION	DEGREES OF FREEDOM	SUM OF SQUARES	MEAN SQUARE	COMPUTED F	TABULATED F	
					0.05	0.01
Replication	2	0.089	0.045			
Treatment	35	76.237	2.178			
A–Location Site	(5)	69.235	13.847	161.97**	2.35	3.29
B–Accessions	(5)	1.904	0.381	2.05ns	2.35	3.29
A x B	(25)	5.098	0.204	2.38**	1.66	2.06
Error	70	5.984	0.085			
TOTAL	107	82.310				

** – Highly significant Coefficient of Variation = 4.79 %

ns – Not significant

APPENDIX TABLE 3. Percent recovery of six accessions grown in six locations

TREATMENT		REPLICATION			TOTAL	MEAN
		I	II	III		
L_1	A_1	75.9	53.8	51.9	181.6	60.50
	A_2	86.0	72.1	74.4	232.5	77.50
	A_3	89.3	92.7	85.0	277.0	92.33
	A_4	91.2	76.2	85.6	253.0	84.33
	A_5	79.9	66.8	88.5	235.2	78.40
	A_6	69.1	72.0	78.0	219.1	43.03
L_2	A_1	71.0	75.6	74.7	221.3	73.77
	A_2	90.8	65.5	83.0	239.3	79.77
	A_3	79.6	82.5	77.3	239.4	99.80
	A_4	92.0	84.9	88.5	265.4	88.47
	A_5	90.7	80.1	87.4	258.2	86.06
	A_6	85.7	85.9	78.5	250.1	83.37
L_3	A_1	83.7	82.4	80.3	246.4	82.13
	A_2	83.5	89.0	80.3	252.8	84.27
	A_3	87.8	82.1	83.4	253.3	84.43
	A_4	93.3	90.0	89.7	273.0	91.00
	A_5	77.5	79.6	85.2	242.3	80.77
	A_6	92.1	93.2	89.7	275.0	91.67
L_4	A_1	82.4	75.7	75.8	233.9	77.97
	A_2	77.4	76.9	91.5	245.8	81.93
	A_3	77.5	69.9	79.8	227.2	75.73
	A_4	79.7	89.0	73.2	241.9	80.63
	A_5	77.9	78.4	76.9	233.2	77.73
	A_6	81.7	71.5	79.3	232.5	77.50
L_5	A_1	83.1	74.3	74.7	232.1	77.37
	A_2	87.1	94.5	87.1	268.7	89.57
	A_3	69.6	72.2	75.4	217.2	72.40
	A_4	88.1	75.7	83.5	247.3	82.43
	A_5	79.6	76.3	81.2	237.1	79.03
	A_6	76.7	74.4	80.7	231.8	77.27
L_6	A_1	73.4	73.5	73.7	220.6	73.53
	A_2	73.7	77.5	72.8	224.0	74.67
	A_3	73.1	71.1	74.5	218.7	72.90
	A_4	76.5	77.5	78.8	232.8	77.60
	A_5	48.8	46.5	37.8	133.1	44.37
	A_6	48.9	68.5	73.6	191.0	63.67

TWO-WAY TABLE

ACCESSIONS	LOCATION SITE						TOTAL	MEAN
	L_1	L_2	L_3	L_4	L_5	L_6		
A_1	60.50	73.77	82.13	77.97	77.37	73.53	445.27	74.21
A_2	77.50	79.77	84.27	81.93	79.57	74.67	487.71	81.29
A_3	92.33	79.80	84.43	75.73	72.40	72.90	477.59	79.60
A_4	84.33	88.47	91.00	80.63	82.43	77.60	504.46	84.08
A_5	78.40	83.06	80.77	77.73	79.03	44.37	446.36	74.39
A_6	73.03	83.37	91.67	77.50	77.27	63.67	466.51	77.75
TOTAL	466.09	491.24	514.27	471.49	478.07	406.74	2827.90	
MEAN	77.68	81.87	85.71	78.58	79.68	67.79		

ANALYSIS OF VARIANCE

SOURCE OF VARIATION	DEGREES OF FREEDOM	SUM OF SQUARES	MEAN SQUARE	COMPUTED F	TABULATED F	
					0.05	0.01
Replication	2	404.275	202.137			
Treatment	35	8086.543	231.044			
A–Location Site	(5)	2874.876	574.975	15.97**	2.35	3.29
B–Accessions	(5)	995.348	199.070	5.53**	2.35	3.29
A x B	(25)	4221.041	168.842	4.69**	1.66	2.06
Error	70	2512.979	35.900			
TOTAL	107	11003.797				

** – Highly significant Coefficient of Variation = 28.9 %

APPENDIX TABLE 4. Chip color of six accessions grown in six locations

TREATMENT		REPLICATION			TOTAL	MEAN
		I	II	III		
L_1	A_1	1	1	1	3	1
	A_2	5	3	5	13	4
	A_3	3	4	3	10	3
	A_4	7	6	6	19	6
	A_5	3	3	4	10	3
	A_6	3	3	3	9	3
L_2	A_1	5	4	4	13	4
	A_2	6	4	5	15	5
	A_3	4	5	4	13	4
	A_4	3	3	3	9	3
	A_5	3	3	3	9	3
	A_6	5	6	6	17	6
L_3	A_1	3	4	3	10	3
	A_2	3	3	3	9	3
	A_3	2	3	3	8	3
	A_4	3	3	4	10	3
	A_5	2	3	3	8	3
	A_6	2	3	2	7	2
L_4	A_1	4	4	4	12	4
	A_2	3	3	3	9	3
	A_3	3	3	3	9	3
	A_4	3	3	3	9	3
	A_5	3	3	3	9	3
	A_6	3	3	3	9	3
L_5	A_1	3	3	4	10	3
	A_2	5	5	4	14	5
	A_3	4	5	4	13	4
	A_4	4	3	3	10	3
	A_5	4	4	4	12	4
	A_6	5	4	4	13	4
L_6	A_1	4	5	4	13	4
	A_2	4	5	5	14	5
	A_3	3	4	4	11	4
	A_4	3	4	4	11	4
	A_5	4	4	4	12	4
	A_6	6	5	4	15	5

TWO-WAY TABLE

ACCESSIONS	LOCATION SITE						TOTAL	MEAN
	L_1	L_2	L_3	L_4	L_5	L_6		
A_1	1	4	3	4	3	4	19	3
A_2	4	5	3	3	5	5	25	4
A_3	3	4	3	3	4	4	21	4
A_4	6	3	3	3	3	4	22	4
A_5	3	3	3	3	4	4	20	3
A_6	3	6	2	3	4	5	23	4
TOTAL	20	25	17	16	23	26		
MEAN	3	4	3	3	4	4		

ANALYSIS OF VARIANCE

SOURCE OF VARIATION	DEGREES OF FREEDOM	SUM OF SQUARES	MEAN SQUARE	COMPUTED F	TABULATED F	
					0.05	0.01
Replication	2	0.130	0.065			
Treatment	35	105.552	3.016			
A–Location Site	(5)	20.713	5.743	20.23**	2.35	3.29
B–Accessions	(5)	8.269	1.654	5.83**	2.35	3.29
A x B	(25)	68.676	2.747	9.68**	1.66	2.06
Error	70	20.345	0.291			
TOTAL	107	126.027				

** – Highly significant Coefficient of Variation = 14.49 %

APPENDIX TABLE 5. Chip browning of six accessions grown in six locations

TREATMENT		REPLICATION			TOTAL	MEAN
		I	II	III		
L_1	A_1	4	4	4	12	4
	A_2	2	2	1	5	2
	A_3	3	3	3	9	3
	A_4	2	2	2	6	3
	A_5	3	3	3	9	2
	A_6	3	3	3	9	3
L_2	A_1	3	3	3	9	3
	A_2	2	3	2	7	3
	A_3	4	3	3	10	2
	A_4	3	3	3	9	3
	A_5	3	3	3	9	3
	A_6	3	2	2	7	3
L_3	A_1	3	3	3	9	2
	A_2	3	3	3	9	3
	A_3	3	3	3	9	3
	A_4	3	3	3	9	3
	A_5	3	3	3	9	3
	A_6	3	3	3	9	3
L_4	A_1	3	3	3	9	3
	A_2	3	3	3	9	3
	A_3	3	3	3	9	3
	A_4	3	3	3	9	3
	A_5	3	3	3	9	3
	A_6	3	3	3	9	3
L_5	A_1	3	3	2	8	3
	A_2	2	2	3	7	2
	A_3	3	3	3	9	3
	A_4	3	3	3	9	3
	A_5	3	3	3	9	3
	A_6	3	3	2	8	3
L_6	A_1	3	3	3	9	3
	A_2	3	3	2	8	3
	A_3	3	3	3	9	3
	A_4	3	3	3	9	3
	A_5	3	3	3	9	3
	A_6	2	2	3	7	2

TWO-WAY TABLE

ACCESSIONS	LOCATION SITE						TOTAL	MEAN
	L_1	L_2	L_3	L_4	L_5	L_6		
A_1	4	3	3	3	2	3	18	3
A_2	2	2	3	3	2	3	15	3
A_3	3	3	3	3	3	3	18	3
A_4	2	3	3	3	3	3	17	3
A_5	3	3	3	3	3	3	18	3
A_6	3	2	3	3	3	2	16	3
TOTAL	17	16	18	18	16	17		
MEAN	3	3	3	3	3	3		

ANALYSIS OF VARIANCE

SOURCE OF VARIATION	DEGREES OF FREEDOM	SUM OF SQUARES	MEAN SQUARE	COMPUTED F	TABULATED F	
					0.05	0.01
Replication	2	0.352	0.176			
Treatment	35	15.435	0.441			
A–Location Site	(5)	8.935	0.187	1.71^{ns}	2.35	3.29
B–Accessions	(5)	4.269	0.854	7.81^{**}	2.35	3.29
A x B	(25)	10.231	0.409	3.74^{**}	1.66	2.06
Error	70	7.648	0.109			
TOTAL	107	23.435				

** – Highly significant Coefficient of Variation = 4.79 %

ns – Not significant

APPENDIX TABLE 6. Crispiness of the potato chips of six accessions grown in six locations

PRODUCTION SITES	ACCESSIONS	PANELIST										TOTAL	MEAN
		1	2	3	4	5	6	7	8	9	10		
L_1 - Loo	96-06	1	2	3	3	5	4	3	2	4	3	33	3
	676089	4	2	3	2	2	3	5	1	1	1	21	2
	573275	2	2	2	2	1	1	2	2	1	2	19	2
	5.19.2.2	5	1	2	2	1	2	2	1	1	3	16	2
	13.1.1	1	1	2	3	1	2	2	1	1	2	16	2
	Ganza	1	1	2	1	3	1	2	1	1	3	16	2
L_2 - Englandad	96-06	1	1	1	2	2	2	2	1	2	3	17	2
	676089	1	4	1	3	1	2	1	1	2	2	18	2
	573275	1	2	1	2	2	2	2	1	2	2	17	2
	5.19.2.2	1	1	1	2	1	1	1	1	3	2	14	1
	13.1.1	1	2	1	2	1	2	1	1	1	3	13	2
	Ganza	2	2	2	2	3	3	3	1	2	1	21	2
L_3 - Balili	96-06	1	1	2	2	2	1	4	2	4	5	25	3
	676089	2	1	1	1	2	2	2	2	4	2	19	2
	573275	2	1	1	1	2	1	2	2	2	4	18	2
	5.19.2.2	2	1	2	2	2	1	2	2	2	3	18	2
	13.1.1	2	1	1	1	2	1	2	1	1	3	15	2
	Ganza	2	2	1	1	2	2	2	1	2	3	18	2
L_4 - Longlong	96-06	2	1	1	1	2	2	4	5	2	2	22	2
	676089	5	1	1	3	1	2	5	4	2	2	26	3
	573275	1	3	2	2	2	1	2	5	2	2	22	2
	5.19.2.2	2	2	1	3	1	2	2	2	2	1	18	2
	13.1.1	1	1	1	5	1	1	2	5	2	4	23	2
	Ganza	4	2	1	4	2	5	2	2	2	1	18	2
L_5 - Cabutotan	96-06	1	1	1	2	1	2	2	1	1	1	15	2
	676089	2	1	1	2	2	3	2	2	2	1	18	2
	573275	2	4	3	5	2	2	4	1	1	2	27	3
	5.19.2.2	3	1	3	4	2	3	5	5	5	1	29	3
	13.1.1	2	1	3	2	3	2	2	2	2	2	22	2
	Ganza	2	2	1	2	2	4	2	1	1	3	22	2
L_6 - Sinipsip	96-06	2	1	2	2	2	3	3	1	2	4	17	2
	676089	2	1	2	2	2	2	3	1	1	2	15	2
	573275	2	1	2	2	2	2	3	1	2	2	17	2
	5.19.2.2	2	1	2	2	2	2	2	1	1	4	15	2
	13.1.1	2	1	2	2	1	1	3	1	1	2	13	1
	Ganza	2	1	1	1	2	2	4	4	2	3	19	2

TWO-WAY TABLE

ACCESSIONS	LOCATION SITE						TOTAL	MEAN
	L_1	L_2	L_3	L_4	L_5	L_6		
A_1	3	2	2	3	2	2	14	2
A_2	2	2	2	2	3	2	13	2
A_3	2	2	3	2	2	2	13	2
A_4	2	1	3	2	2	2	12	2
A_5	2	2	2	2	2	1	11	2
A_6	2	2	2	2	2	2	12	2
TOTAL	13	11	14	13	13	11		
MEAN	2	2	2	2	2	2		

ANALYSIS OF VARIANCE

SOURCE OF VARIATION	DEGREES OF FREEDOM	SUM OF SQUARES	MEAN SQUARE	COMPUTED F	TABULATED F	
					0.05	0.01
Replication	9	33.711	3.746			
Treatment	35	65.589	1.874			
A–Location Site	(5)	14.122	2.824	2.14^{ns}	2.24	3.08
B–Accessions	(5)	7.022	1.404	1.61^{ns}	2.24	3.08
A x B	(25)	44.444	1.778	1.61^{**}	1.51	1.76
Error	315	274.689	0.872			
TOTAL	359	373.989				

** – Highly significant Coefficient of Variation = 46.82 %

^{ns} – Not significant

APPENDIX TABLE 7. Taste of the potato chips of six accessions grown in six locations

PRODUCTION SITES	ACCESSIONS	PANELIST										TOTAL	MEAN
		1	2	3	4	5	6	7	8	9	10		
L_1 - Loo	96-06	4	2	2	3	4	3	4	2	2	3	29	3
	676089	2	3	3	1	2	3	3	4	1	2	24	2
	573275	3	2	2	4	1	3	2	2	2	3	24	2
	5.19.2.2	3	2	4	4	3	3	3	2	2	4	30	3
	13.1.1	2	1	2	3	2	4	3	1	3	1	22	2
	Ganza	4	1	4	4	2	4	3	3	2	2	29	3
L_2 - Englandad	96-06	3	4	2	4	2	2	2	2	3	2	26	3
	676089	3	3	2	4	2	2	3	1	3	2	25	3
	573275	3	1	2	4	1	3	2	3	1	2	22	2
	5.19.2.2	3	4	3	4	2	1	2	1	2	4	26	3
	13.1.1	3	2	2	3	1	1	2	1	2	1	18	2
	Ganza	2	1	3	4	1	3	2	3	3	1	23	2
L_3 - Balili	96-06	4	1	2	3	3	3	3	2	2	5	28	3
	676089	3	2	2	1	2	3	3	3	4	5	28	3
	573275	2	1	2	2	2	3	3	3	2	2	22	2
	5.19.2.2	3	2	1	1	2	2	3	3	2	4	23	2
	13.1.1	4	2	1	1	2	3	3	2	2	5	25	3
	Ganza	1	2	1	2	3	3	3	2	2	4	23	2
L_4 - Longlong	96-06	4	2	3	2	3	1	4	4	3	2	28	3
	676089	5	2	2	3	2	2	5	2	3	2	28	3
	573275	4	1	4	2	3	2	3	2	3	2	26	3
	5.19.2.2	2	1	2	2	3	2	2	5	3	2	24	2
	13.1.1	4	2	2	5	2	3	2	3	2	4	29	3
	Ganza	4	2	4	3	3	4	3	4	5	4	36	4
L_5 - Cabutotan	96-06	2	2	3	2	2	3	3	1	2	3	23	2
	676089	2	2	1	2	2	4	2	1	2	4	22	2
	573275	3	4	1	4	3	2	3	2	2	3	27	3
	5.19.2.2	3	3	3	3	2	3	5	3	3	4	32	3
	13.1.1	3	2	2	2	3	2	2	2	3	2	23	2
	Ganza	3	2	1	2	2	3	3	1	3	2	22	2
L_6 - Sinipsip	96-06	4	2	3	1	2	2	2	1	2	4	19	2
	676089	4	1	2	2	2	1	4	1	5	3	22	2
	573275	3	2	2	1	2	3	5	3	4	1	25	3
	5.19.2.2	3	1	2	1	2	2	5	2	2	3	20	2
	13.1.1	4	2	3	1	2	2	5	2	2	2	23	2
	Ganza	4	1	2	1	2	4	4	4	3	2	25	3

TWO-WAY TABLE

ACCESSIONS	LOCATION SITE						TOTAL	MEAN
	L_1	L_2	L_3	L_4	L_5	L_6		
A_1	3	3	2	3	3	2	16	3
A_2	2	3	2	3	3	2	15	3
A_3	2	2	3	2	3	3	15	3
A_4	3	3	3	3	2	2	15	3
A_5	2	2	2	3	3	2	14	2
A_6	3	2	2	2	4	3	16	3
TOTAL	15	15	14	15	18	14		
MEAN	3	3	2	3	3	2		

ANALYSIS OF VARIANCE

SOURCE OF VARIATION	DEGREES OF FREEDOM	SUM OF SQUARES	MEAN SQUARE	COMPUTED F	TABULATED F	
					0.05	0.01
Replication	2	47.789	5.310			
Treatment	35	40.889	1.168			
A–Location Site	(5)	9.422	1.884	2.09^{ns}	2.24	3.08
B–Accessions	(5)	4.122	0.824	0.91^{ns}	2.24	3.08
A x B	(25)	27.344	1.094	1.21^{ns}	1.51	1.76
Error	315	284.611	0.904			
TOTAL	359	373.611				

^{ns} – Not significant Coefficient of Variation = 37.36 %

APPENDIX TABLE 8. Oiliness of the potato chips of six accessions grown in six locations

PRODUCTION SITES	ACCESSIONS	PANELIST										TOTAL	MEAN
		1	2	3	4	5	6	7	8	9	10		
L_1 - Loo	96-06	1	2	2	4	3	3	4	2	2	3	32	3
	676089	4	2	2	3	2	2	3	2	1	2	21	2
	573275	2	2	2	2	1	2	4	5	2	2	26	3
	5.19.2.2	4	1	2	4	1	2	3	1	2	2	21	2
	13.1.1	2	1	2	3	2	3	3	1	3	1	20	2
	Ganza	1	2	2	2	3	3	2	1	2	2	20	2
L_2 - Englandad	96-06	1	2	3	2	2	3	2	2	2	2	21	2
	676089	1	2	3	2	1	3	2	2	2	2	20	2
	573275	1	2	3	1	3	2	3	2	2	2	22	2
	5.19.2.2	1	2	3	2	2	1	2	2	2	3	20	2
	13.1.1	1	2	3	1	2	2	2	2	1	3	19	2
	Ganza	1	2	3	1	2	3	3	2	2	1	21	2
L_3 - Balili	96-06	2	1	1	1	1	2	2	2	3	3	19	2
	676089	3	1	2	1	1	2	2	2	2	2	19	2
	573275	3	1	2	2	2	1	2	2	2	3	20	2
	5.19.2.2	2	2	1	1	1	1	2	2	2	4	19	2
	13.1.1	3	1	2	1	1	1	2	2	2	2	18	2
	Ganza	1	2	2	3	3	2	2	2	2	2	21	2
L_4 - Longlong	96-06	1	2	2	1	3	1	3	2	2	2	22	2
	676089	2	2	2	2	2	1	4	3	3	2	23	2
	573275	4	2	2	2	3	1	5	4	4	2	27	3
	5.19.2.2	2	2	2	2	2	2	2	1	3	2	19	2
	13.1.1	2	2	2	2	4	2	3	3	4	2	28	3
	Ganza	1	2	2	3	2	4	3	3	2	2	25	3
L_5 - Cabutotan	96-06	4	4	2	4	2	2	2	2	2	2	24	2
	676089	2	3	2	3	2	3	3	2	2	2	24	2
	573275	2	3	2	3	2	2	2	2	2	2	22	2
	5.19.2.2	2	3	2	4	2	3	4	4	2	2	28	3
	13.1.1	2	2	2	4	3	2	3	3	2	4	27	3
	Ganza	2	1	2	4	2	3	2	2	3	4	25	3
L_6 - Sinipsip	96-06	3	2	2	2	2	3	2	1	2	2	21	2
	676089	4	2	2	1	1	2	3	4	1	1	22	2
	573275	4	1	2	1	1	2	3	5	1	1	22	2
	5.19.2.2	3	2	2	2	2	3	4	1	2	2	22	2
	13.1.1	4	2	2	3	3	5	1	2	2	2	25	3
	Ganza	4	4	2	2	2	3	4	1	4	4	30	3

TWO-WAY TABLE

ACCESSIONS	LOCATION SITE						TOTAL	MEAN
	L_1	L_2	L_3	L_4	L_5	L_6		
A_1	3	2	2	2	2	2	13	2
A_2	2	2	2	2	2	2	12	2
A_3	3	2	2	2	3	2	14	2
A_4	2	2	3	2	2	2	13	2
A_5	2	2	3	2	3	3	15	3
A_6	2	2	3	2	3	3	15	3
TOTAL	13	12	13	12	15	14		
MEAN	2	2	2	2	3	2		

ANALYSIS OF VARIANCE

SOURCE OF VARIATION	DEGREES OF FREEDOM	SUM OF SQUARES	MEAN SQUARE	COMPUTED F	TABULATED F	
					0.05	0.01
Replication	2	12.933	1.437			
Treatment	35	33.489	0.957			
A–Location Site	(5)	12.956	2.591	1.71^{ns}	2.24	3.08
B–Accessions	(5)	0.489	0.098	0.14^{ns}	2.24	3.08
A x B	(25)	20.044	0.802	1.15^{ns}	1.51	1.76
Error	315	220.067	0.699			
TOTAL	359	266.489				

^{ns} – Not significant Coefficient of Variation = 37.24 %

APPENDIX TABLE 9. Texture of the potato chips of six accessions grown in six locations

PRODUCTION SITES	ACCESSIONS	PANELIST										TOTAL	MEAN
		1	2	3	4	5	6	7	8	9	10		
L_1 - Loo	96-06	4	2	2	3	1	3	2	2	2	2	23	2
	676089	1	2	1	2	1	2	2	2	1	4	18	2
	573275	5	1	1	3	1	3	4	2	2	3	24	2
	5.19.2.2	1	1	1	1	2	2	2	1	1	3	15	2
	13.1.1	2	1	1	1	2	3	2	1	1	1	15	2
	Ganza	2	1	1	1	2	2	1	3	1	1	15	2
L_2 - Englandad	96-06	4	1	3	2	2	2	2	3	2	3	24	2
	676089	4	1	3	2	1	3	1	3	2	2	22	2
	573275	4	1	3	1	1	2	1	3	2	2	20	2
	5.19.2.2	2	1	3	1	1	2	1	3	3	3	20	2
	13.1.1	3	1	3	1	2	2	1	3	1	1	18	2
	Ganza	1	1	3	1	3	3	2	3	2	2	21	2
L_3 - Balili	96-06	1	1	2	1	1	2	1	2	3	3	17	2
	676089	1	2	2	1	1	3	1	2	3	2	18	2
	573275	1	1	2	1	1	1	1	2	2	3	15	2
	5.19.2.2	1	1	1	1	1	1	1	2	2	3	14	1
	13.1.1	1	1	2	1	1	1	1	1	2	4	16	2
	Ganza	1	2	1	1	1	2	1	2	2	3	16	2
L_4 - Longlong	96-06	2	2	1	1	1	1	3	1	3	3	18	2
	676089	1	1	1	3	1	2	5	2	3	2	21	2
	573275	2	1	1	2	2	1	4	1	2	2	18	2
	5.19.2.2	2	1	1	2	1	2	2	1	2	2	16	2
	13.1.1	3	2	1	2	2	1	2	1	2	3	19	2
	Ganza	2	2	1	3	2	4	3	3	4	3	27	3
L_5 - Cabutotan	96-06	1	4	1	2	3	2	4	2	2	2	23	2
	676089	1	4	1	2	2	2	3	1	3	1	20	2
	573275	1	2	2	3	3	2	4	1	2	1	21	2
	5.19.2.2	2	3	2	2	2	2	4	2	2	2	23	2
	13.1.1	1	4	2	2	2	2	3	2	3	3	24	2
	Ganza	1	4	1	2	3	2	4	4	3	2	26	3
L_6 - Sinipsip	96-06	2	1	1	2	2	2	2	1	3	4	20	2
	676089	4	2	1	1	1	1	3	1	1	2	17	2
	573275	3	1	1	2	1	3	2	1	2	2	18	2
	5.19.2.2	3	1	1	2	1	3	2	1	2	2	20	2
	13.1.1	2	2	1	2	3	1	5	1	1	2	20	2
	Ganza	3	2	1	2	3	3	4	1	2	1	22	2

TWO-WAY TABLE

ACCESSIONS	LOCATION SITE						TOTAL	MEAN
	L_1	L_2	L_3	L_4	L_5	L_6		
A_1	2	2	2	2	2	2	12	2
A_2	2	2	2	2	2	2	12	2
A_3	2	2	2	2	2	2	12	2
A_4	2	2	2	1	2	2	11	2
A_5	2	2	2	2	2	2	12	2
A_6	2	2	3	2	3	2	14	2
TOTAL	12	12	13	11	13	12		
MEAN	2	2	2	2	2	2		

ANALYSIS OF VARIANCE

SOURCE OF VARIATION	DEGREES OF FREEDOM	SUM OF SQUARES	MEAN SQUARE	COMPUTED F	TABULATED F	
					0.05	0.01
Replication	2	29.112	3.236			
Treatment	35	40.889	1.168			
A–Location Site	(5)	16.456	3.291	4.15^{**}	2.24	3.08
B–Accessions	(5)	4.689	0.928	1.15^{ns}	2.24	3.08
A x B	(25)	19.744	0.790	0.99^{ns}	1.51	1.76
Error	315	249.278	0.791			
TOTAL	359	319.289				

** – Highly significant

Coefficient of Variation = 49.49 %

^{ns} – Not significant

APPENDIX TABLE 10. Appearance of the potato chips of six accessions grown in six locations

PRODUCTION SITES	ACCESSIONS	PANELIST										TOTAL	MEAN
		1	2	3	4	5	6	7	8	9	10		
L_1 - Loo	96-06	4	1	2	4	4	3	3	2	3	3	29	3
	676089	1	1	2	3	3	2	4	4	2	4	26	3
	573275	2	2	2	4	1	3	4	3	3	2	26	3
	5.19.2.2	4	1	4	1	3	2	2	1	1	4	23	2
	13.1.1	2	1	3	2	3	2	2	1	1	1	18	2
	Ganza	3	1	3	3	3	3	1	3	2	2	24	2
L_2 - Englandad	96-06	2	1	2	4	2	2	2	3	2	3	23	2
	676089	1	3	2	4	2	3	2	4	2	2	25	3
	573275	3	2	2	3	4	2	2	2	3	3	26	3
	5.19.2.2	3	1	1	4	1	1	3	1	4	1	20	2
	13.1.1	3	1	1	2	2	1	2	1	2	1	16	2
	Ganza	4	3	3	2	3	3	2	4	3	2	29	3
L_3 - Balili	96-06	3	1	2	2	3	3	4	3	3	4	28	3
	676089	3	2	2	1	2	2	3	2	3	5	25	3
	573275	2	1	1	2	2	1	3	2	2	2	18	2
	5.19.2.2	4	1	2	2	2	1	3	2	2	4	23	2
	13.1.1	2	1	2	1	2	1	4	2	2	4	21	2
	Ganza	1	1	2	2	2	2	4	1	2	4	21	2
L_4 - Longlong	96-06	4	1	2	3	2	2	4	5	3	3	29	3
	676089	2	2	2	3	2	2	4	4	4	3	31	3
	573275	3	1	3	2	3	2	4	2	3	3	26	3
	5.19.2.2	2	1	2	2	3	2	3	1	3	3	22	2
	13.1.1	5	2	2	2	3	3	3	4	2	3	29	3
	Ganza	4	1	3	3	3	5	4	2	3	3	31	3
L_5 - Cabutotan	96-06	2	2	2	2	2	2	3	2	2	2	21	2
	676089	2	2	2	2	3	4	4	2	2	2	23	2
	573275	2	4	2	5	3	2	3	2	2	2	27	3
	5.19.2.2	2	3	2	3	2	3	2	2	2	2	23	2
	13.1.1	2	4	3	3	3	3	2	3	3	4	30	3
	Ganza	3	3	2	2	2	4	3	2	3	3	27	3
L_6 - Sinipsip	96-06	2	2	2	1	3	3	3	2	4	3	25	3
	676089	4	2	2	2	2	1	3	1	4	2	23	2
	573275	3	2	2	1	2	4	2	2	3	2	23	2
	5.19.2.2	3	1	2	1	2	3	3	1	2	2	20	2
	13.1.1	4	1	3	2	3	4	4	2	1	2	26	3
	Ganza	3	2	2	1	3	2	4	2	2	3	24	2

TWO-WAY TABLE

ACCESSIONS	LOCATION SITE						TOTAL	MEAN
	L_1	L_2	L_3	L_4	L_5	L_6		
A_1	3	2	2	3	3	3	16	3
A_2	3	3	2	3	3	2	16	3
A_3	3	3	3	2	3	2	16	3
A_4	2	2	2	2	2	2	12	2
A_5	2	2	3	2	3	3	15	3
A_6	2	3	3	2	3	2	15	3
TOTAL	15	15	15	14	17	14		
MEAN	3	3	3	2	3	2		

ANALYSIS OF VARIANCE

SOURCE OF VARIATION	DEGREES OF FREEDOM	SUM OF SQUARES	MEAN SQUARE	COMPUTED F	TABULATED F	
					0.05	0.01
Replication	2	41.611	4.633			
Treatment	35	45.689	1.305			
A–Location Site	(5)	9.689	1.938	2.53^{*}	2.24	3.08
B–Accessions	(5)	7.922	1.584	2.06^{ns}	2.24	3.08
A x B	(25)	28.078	1.133	1.46^{ns}	1.51	1.76
Error	315	241.89	0.767			
TOTAL	359	328.889				

** –Significant Coefficient of Variation = %

ns – Not significant

APPENDIX TABLE 11. General acceptability of the potato chips of six accessions grown in six locations

PRODUCTION SITES	ACCESSIONS	PANELIST										TOTAL	MEAN
		1	2	3	4	5	6	7	8	9	10		
L_1 - Loo	96-06	1	1	2	4	2	2	2	3	2	3	22	2
	676089	1	1	2	4	2	3	2	3	3	2	23	2
	573275	2	1	2	2	2	2	2	1	2	3	19	2
	5.19.2.2	2	2	1	4	1	1	2	2	4	3	22	2
	13.1.1	3	1	2	2	1	2	1	2	1	2	17	2
	Ganza	4	1	3	3	3	3	2	4	2	2	27	3
L_2 - Englandad	96-06	4	2	3	4	3	4	3	2	3	3	31	3
	676089	2	2	2	3	2	2	2	4	1	5	25	3
	573275	4	2	2	3	1	3	2	2	2	4	25	3
	5.19.2.2	3	2	4	2	3	2	3	1	2	3	23	3
	13.1.1	2	1	3	3	3	3	2	1	1	1	20	2
	Ganza	2	1	3	2	3	3	2	3	2	1	22	2
L_3 - Balili	96-06	3	1	2	2	3	2	4	3	4	5	29	3
	676089	3	1	2	1	2	3	4	2	2	5	25	3
	573275	2	1	2	2	2	1	4	2	2	2	20	2
	5.19.2.2	3	1	2	2	2	1	4	2	1	4	22	2
	13.1.1	4	1	2	1	2	1	4	2	1	3	21	2
	Ganza	1	2	1	2	3	2	4	1	2	4	22	2
L_4 - Longlong	96-06	4	1	2	2	2	2	4	4	3	3	27	3
	676089	5	2	2	3	2	2	4	5	3	3	31	3
	573275	3	1	3	2	3	2	4	4	3	3	28	3
	5.19.2.2	2	2	2	2	3	2	3	1	2	3	22	2
	13.1.1	5	2	2	4	2	3	2	4	2	3	29	3
	Ganza	4	1	3	3	3	5	3	3	5	4	34	3
L_5 - Cabutotan	96-06	2	2	2	2	2	2	2	2	2	2	20	2
	676089	2	2	1	2	2	4	4	2	2	1	22	2
	573275	2	4	2	5	3	2	4	2	2	1	27	3
	5.19.2.2	2	3	3	3	2	3	4	4	4	2	28	3
	13.1.1	2	3	3	3	3	3	2	2	2	3	27	3
	Ganza	3	3	1	2	3	4	2	1	1	3	24	2
L_6 - Sinipsip	96-06	2	1	3	1	3	3	2	1	4	4	24	2
	676089	3	2	2	1	2	1	3	1	4	2	21	2
	573275	3	1	2	1	2	4	4	2	3	3	25	3
	5.19.2.2	3	1	2	1	2	3	3	2	2	3	22	2
	13.1.1	3	1	3	2	3	3	5	2	2	2	26	3
	Ganza	3	2	2	1	3	3	4	3	2	3	26	3

TWO-WAY TABLE

ACCESSIONS	LOCATION SITE						TOTAL	MEAN
	L_1	L_2	L_3	L_4	L_5	L_6		
A_1	2	3	2	3	3	2	15	3
A_2	2	3	2	3	3	2	15	3
A_3	2	3	3	2	3	3	16	3
A_4	2	3	3	2	2	2	14	2
A_5	2	2	3	2	3	3	15	3
A_6	3	2	2	2	3	3	15	3
TOTAL	13	16	15	16	17	15		
MEAN	2	3	3	3	3	3		

ANALYSIS OF VARIANCE

SOURCE OF VARIATION	DEGREES OF FREEDOM	SUM OF SQUARES	MEAN SQUARE	COMPUTED F	TABULATED F	
					0.05	0.01
Replication	2	48.633	5.437			
Treatment	35	45.456	1.299			
A–Location Site	(5)	13.622	3.124	3.75^{**}	2.24	3.08
B–Accessions	(5)	3.22	0.604	0.79^{ns}	2.24	3.08
A x B	(25)	26.511	1.060	1.27^{ns}	1.51	1.76
Error	315	262.267	0.833			
TOTAL	359	356.656				

** –Significant Coefficient of Variation = %

^{ns} – Not significant