BIBLIOGRAPHY

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Adviser: Esther Josephine Sagalla, MSc

ABSTRACT

The study aimed to identify the location that produces potato selections with the best fry quality, determine the potato entry with the best potato fry quality and determine the interaction between locations and potato entries on fry quality.

The potato tubers harvested in Loo had the highest dry matter content and fry yield. In addition, the fries produced from entries harvested at Loo were liked much by the panelists. The fries produced from the tubers harvested at Bonglo and Sagpat were moderately crispy, moderately perceptible, moderately oily, slightly firm, slightly brown and were liked moderately by the panelists.

CIP 2.21.6.2 and Igorota have good fry quality based on high dry matter content and high fry yield. Both entries produced fries which were liked much by the panelists.

Growing CIP 2.21.6.2 and Igorota in Loo might result in the production of tubers with good fry quality.

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INTRODUCTION

Filipino people both young and old enjoy potato fries due to its appealing taste and low cost. As a result, a growing demand for potato snack food (BPRE, 2007) is observed. However, Philippines is more of an importer than an exporter of fresh and processed potatoes. In 2006, the Philippines imported 61,699 mt of a wide range of processed potato products having a value of $ 30.5 M (PCARRD, 2008).

In addition, potato varieties such as Granola which are commonly grown in Benguet are often not suitable for processing. Thus, the country needs immediate action to continuously produce and evaluate potential processing varieties to sufficiently supply the increasing demand for processed potatoes (Balaoing, 2006).

The most significant factor that may influence quality of potatoes for processing is the variety. Varieties for potato fries must have a tuber dry matter content of 21-24 % for high fry recovery, less oil uptake, crispy texture and light yellow or light brown sticks (Balaoing, 2006). Potato processors are inclined to pay significant price premiums if such favored varieties are developed (Van der Zaag, 1990). However, Cordillera which produces 75% of potatoes in the Philippines (PCARRD, 2008) grow a limited number of varieties suitable for processing. Thus, continuous selection for varieties suitable for processing must be done.

Another factor which may influence fry processing quality is the growing condition. Different growing conditions may enhance processing qualities of these varieties. Therefore, evaluation of the processing varieties grown from different locations is important.

The study was conducted to:

1. identify the location that produces potato selections with the best fry quality;
2. determine the potato entry with the best potato fry quality; and
3. determine the interaction between locations and potato selection on fry quality.

The study was conducted at the Northern Philippine Root Crops Research and Training Center on October 2008.

REVIEW OF LITERATURE

Nutritive Content of Potato

Potato is approximately 80% water, 17% carbohydrates, 20% protein in its raw and cooked status. As a consequence, energy content of raw potato is less than that of raw cereals and legumes (Artzen, 1994).

One hundred grams of French fries have a nutrient content of 309.1 cal. food energy, 4.0 grams of protein, 38.6 grams of carbohydrates, 16.1 grams of total fat, 5.0 grams of saturated fat, 3.2 grams of dietary fiber, 712.0 milligrams of potassium, 5.3 milligrams of vitamin C, 33.0 micrograms of foliate, 29.0 milligrams of vitamin A (FFD, 2001).

Preferred Tuber Characteristics for Fries

Netherlands Potato Consultative Foundation (NIVAP, 2007) stated that the external quality of potatoes is extremely important in the processing industry. Characteristics of particular interest are the shape and the extent of external damage. Size, shape and shallow eyes are important with regard to the appearance of the product and the influence on wastage during peeling. French fry producers prefer long oval or long tubers with a size of at least 50 mm. Both the processing efficiency and quality of the finished product benefit from a high dry matter content. For the production of French fries, potatoes with a dry matter content of 20-24% are preferred. If the dry matter content is too low, the French fry will be soft or too wet. A high dry matter content concentration results in a lower fat content. This lowers the processing costs and is better

for the health of consumers. However, if the dry matter content is too high, the French fry will be too hard and dry.

According to Batt (2001), the four most important attributes that Filipino potato farmer's sought for their most preferred variety was tuber size, tuber shape, skin color and the suitability of the variety to the growing environment. The tuber size, tuber shape and skin color are no doubt related to the marketability of the tubers.

Potatoes intended for processing as French fry should have a sugar level less than 1.2% mg/g or 0.125% of the tuber fresh weight. Potatoes with higher values than these will usually show color problems after cooking (Stark *et al*., 2001). Potatoes with low starch can lead to poor texture and excess oiliness while high reducing sugars caused undesirable dark fry color (Mosley, 2005).

Another important aspect of characteristics for processing quality is the color distribution. Unevenness in color distribution results in French fry with a brown color at one end. The cause of this phenomenon is senescence after long storage and secondary growth (NIVAP, 2007).

Frozen processing varieties are preferably high in starch (high dry matter) and low in reducing sugars. Approximately 80% of tuber dry matter is starch. High dry matter potatoes are frequently thought as "dry" for most culinary purposes where as low dry matter varieties are considered as "moist". Tubers with less than about 18% dry matter are seldom used for frozen processing because of poor texture. Approximately two-thirds of the water in French fries is replaced by oil during frying. Varieties with high water or low dry matter produce oily, soggy French fries. Because more water must

be removed during processing, product recovery is low and the cost of fry production is higher making such varieties unprofitable in most situations (Mosley, 2005).

Mosley (2005) mentioned also that potato varieties vary in appearance, season of maturity, internal composition, yield and tuber quality, pest and disease resistance and adaptability. Early maturing varieties typically have short storage dormancy and are usually processed at harvest on shortly afterward. Leading frozen processing varieties are relatively late maturing, have long storage dormancies and can be processed for several months. Hollow heart, internal brown spot, sugar-ends and stem-end discoloration caused from heat, moisture and other environmental stresses during their growing season. The disorders severely reduce processing quality, especially for frozen fries which must be uniform in appearance. Sugar-end for example, causes "dark-end" fries which are unacceptable to the industry and must be discarded.

Tuber Moisture Content and Crispness

The increase in final frying time increased crispness, but it cannot counterbalance a lack of pre-frying. The differences in crispness due to different pre-frying time cannot be explained in terms of moisture content of the whole French fries, but can be explained in terms of the moisture content of the outer layer. The pre-frying step likely affects the morphology of the outer crust by allowing an easier loss of water during the final frying step (Sanz *et al.*, 2007).

Factors Affecting Tuber Dry Matter Content

Date of planting (early planting) helps increase dry matter content by lengthening the growth period. Crops that mature early generally have higher dry matter

content than later plantings. The earlier the plants appear and can begin to produce solids from photosynthesis the better. Soil type, water holding capacity, drainage, structure, fertility and temperature of the soil can affect dry matter. For example, a sandy soil could be expected to drain better than a clay loam. In a wet season this could be an advantage and a higher dry matter may result. In order for the potatoes to achieve optimal maturity and reach good dry matter levels at harvest, the tubers should be left as long as possible, bearing in mind the comments made on time of planting and the growth period (Kellock, 1995).

Factors Affecting Tuber Sugar Content

Stark *et al*. (2001) mentioned that tuber maturity, temperature**,** variety**,** storage stress and handling affect the sugar content of a tuber. As the tuber grow and mature, the sugar content decreases, reaching the lowest point when the vines are rearing complete senescence. For potatoes intended for French fry processing, the temperature is about 47 to 50^{o}F. It is critical to match varieties with intended use. Potatoes bred for French fry processing typically have intermediate sugar contents.

The major factors that influence tuber sugar concentrations and fry color are the growing season, cultivar and storage management. Fertilization practices, diseases, and other management practices can also have an effect (Sanders, 2008).

Alingbas (2007), found out that the lowest sugar content was obtained from accessions 96-06 (5.88 ^{o}Brix) while the highest sugar content was obtained from accessions 5.19.2.2. (6.29 ^{o}Brix).

Sugar content is a varietal characteristic that maybe influenced by environmental factors in a location (Peet, 2007).

Processing of Potato Fries

Raw products play an important role in processing, fry yield and finished quality. Every effort should be made to obtain potatoes with few external and internal defects and of the proper starch and sugar content. Tuber malformations and mechanical injury can lead to excessive peel and trim loss. Trimming and peeling potatoes reduces overall weight by approximately 22%. Blanching using hot water reduces total raw product weight an additional 5-10%. Par-frying reduces raw product weight an additional 16% despite 6-8% oil absorption. Par-frying assures that all enzyme activity is terminated and tissues are stabilized for long-term frozen at about -23.3 to 28^{o}C on conveyor lines to stabilize the tissues in preparation for packaging and long term storage (Mosley, 2005).

Potato Fry Storage

Par fries can be held long-term in a frozen state. Smaller cuts can be stored up to 12 months and larger cuts up to 18 to 24 months at about -18^{o}C without serious loss of quality due to dehydration. However, processors prefer to store only 6-9 months (Mosley, 2005).

Potato Varieties Identified in the Philippines

Four new potato varieties which possesses the desired dry matter content required by the fast-food chains to make good French fries were Igorota, Solibao, Ganza and the fourth one which has yet to be given an official tag (Cariño, 2007).

Results of Local Studies

Igorota variety is good for processing because of its 16.6-17.50% dry matter content and sugar content of 4.00-4.74 ^{o}Brix. The potato fries also were moderately crispy, moderately perceptible, moderately oily, moderately firm, and liked very much by the panelist (Ruega, 2005).

Alingbas (2007) found out that Balili and Longlong are the best sites in growing organic potatoes for chip processing because these sites produced high chip yield and light yellow chips with moderately browning. In addition, 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 the panelists.

MATERIALS AND METHODS

Marketable potato tubers harvested from different locations of Benguet were used for potato fries. Five hundred grams of sound potato tubers per replication per entry was processed. The potato tubers were washed, peeled and cut into 7mm to 12 mm thick sticks (Macmillan, 2000). The sticks were soaked in cold water and pat dried using clean cotton cloth.

The dried strips were partially fried or par-fried for about 2 to 3 minutes in hot vegetable oil under 180^{o}C. The par-fried strips were packed and quickly frozen at about 1^{o}C within 7 to 9 days. The frozen par-fried sticks were finally fried at about 2-3 minutes under 180^{o}C until the oil stops bubbling. Finally, the fried entries were quickly evaluated by ten panelists.

The experiment was laid out in split- plot design with three replications. The treatments were:

Mainplot: Location of Production (L)

Code	Location
L_1	Loo, Buguias
L_2	Bonglo, Atok
L_3	Sagpat, Kibungan

Subplot: Potato Entries (E)

Code	Entry	Locality of Collection
E_1	CIP 380241.17	CIP
E_2	PHIL 5.19.2.2	Philippines

E_3	CIP 676070	CIP
E_4	CIP 573275	CIP
E_5	PHIL 2.21.6.2	Philippines
E_6	Granola- Cv	CIP
E_7	Ganza- Cv	CIP
E_8	Igorota- Cv	Philippines

Data Gathered

A. Potato Tuber

1. Dry matter content. This was taken by oven drying 50 g of sliced potato tubers for 72 hours at 70°C. This was computed using the formula:

% Dry Matter Content = 100% - % Moisture content

Where:

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

2. Sugar content (°Brix). This was taken by extracting the juice of 20 g potato tubers on a digital refractometer.

B. Potato Fries

1. Potato fry yield. This was taken by using the formula:

$$\text{Potato Fry Yield} = \frac{\text{Weight of unpeeled tubers – Weight of sliced tubers}}{\text{Weight of unpeeled tubers}} \times 100$$

2. Potato fry color. After final frying, the color of the fries was evaluated using the color chart provided by Stark *et al.* (2001).

Weighing 500 g of tubers

Peeling

Soaking to avoid browning

Weighing

Pat-drying

Slicing into sticks

Par-frying for 2-3 minutes

Packing

Sealing

Evaluating of 10 panelists

Final frying

Freezing at 1^{o}C

Figure 1. Methodology of the study

3. Potato fry sugar end. After final frying, the fry's sugar end was evaluated by using the following scale:

Scale	Description
1	Present
2	Absent

4. Sensory evaluation. Sensory evaluation includes crispness, taste, oil absorption, texture, browning and general acceptability. After final frying, ten non-smoking panelist aged 13 and above evaluated the fries using the following parameters (Mabesa, 1986):

a. Crispness

Scale	Remarks
1	very crispy
2	crispy
3	moderate crispness
4	slight crispness
5	no crispness

b. Taste

Scale	Remarks
1	very perceptible
2	perceptible
3	moderately perceptible
4	slightly perceptible
5	not perceptible

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. Browning

Scale	Remarks	Rate
1	severe browning	6% browning
2	moderate browning	3-5%browning
3	slight browning	1-2%browning
4	not browning	0% browning

f. General acceptability

Scale	Remarks
1	like very much
2	like much

3	like moderately
4	like slightly
5	dislike or not like

Analysis of Data

All quantitative data was analyzed using analysis of variance for Split-Plot Design with three replications. The significance of differences among treatment means was tested using Duncan's Multiple Range Test (DMRT) at 5% level of significance.

RESULTS AND DISCUSSION

Temperature, Relative Humidity and Rainfall

The temperature, relative humidity and rainfall from the different locations were taken from July 2008 to September 2008 (Table 1).

Potatoes grow best in temperature ranging from 17-22 ^{o}C (HARRDEC, 1996). Loo, Bonglo and Sagpat are within this temperature range which maybe favorable to the production of potatoes for good fry quality.

Relative humidity (95.62%) and rainfall (6.73L) are highest in Bonglo. Relative humidity and rainfall might influence the fry quality of the potato tubers by causing changes in the dry matter of tubers. For instance excess of water during the growth of the plants will result to low dry matter content (Kellock, 1995).

Table 1. Temperature, relative humidity, and rainfall from July to September 2008

TREATMENT	LOO, BUGUIAS	BONGLO, ATOK	SAGPAT, KIBUNGAN
Temperature (^{o}C)	17.75	18.20	18.14
Relative humidity (%)	77.32	95.62	83.54
Rainfall (L)	0.82	6.73	1.27

Dry Matter Content

Effect of location. Highly significant differences are observed on dry matter content of the tubers harvested from different locations. Tubers harvested from Loo gave the highest dry matter (Table 2). Dry matter content might be attributed to the rainfall and relative humidity during the growth stage of the plants.

Loo and Sagpat which had the highest rainfall and relative humidity produced tubers with low dry matter content. Excessive water is said to result to low dry matter content in the potato tubers (Kellock, 1995). However, all the tubers harvested from the different locations might be suitable for processing due to their above 18% dry matter content.

Effect of entry. The tuber dry matter content of the different entries ranged from 18 to 20%. The highest dry matter content of 20% was obtained from CIP 380241.17, PHIL 5.19.2.2, CIP 573275, PHIL 2.21.6.2 and Igorota.

All the entries may be used for fry processing since tubers with less than 18% dry matter are seldom used for frozen processing because of poor texture (Mosley, 2005).

The dry matter content of the different entries might be attributed to their genetic characteristic and maturity of the crops. Entries that mature early generally have higher dry matter content (Kellock, 1995).

Interaction effect. A highly significant interaction was observed between locations and entries on tuber dry matter content. CIP 380241.17 and CIP 573275 planted in Loo gained the highest tuber dry matter content (Fig. 2).

Dry matter content is affected by genetic characteristics but maybe influenced by water uptake, temperature, photoperiod and others (Rastovski *et al*., 1981). Thus, both

entries and location must be considered in selecting potato entries for processing in terms of dry matter content.

Table 2. Dry matter content of potato entries harvested across locations

TREATMENT	DRY MATTER CONTENT (%)
Location (L)	
Loo	20[a]
Bonglo	19[b]
Sagpat	19[b]
Potato Entry (PE)	
CIP 380241.17	20[a]
PHIL 5.19.2.2	20[a]
CIP 676070	19[b]
CIP 573275	20[a]
PHIL 2.21.6.2	20[a]
Granola	18[c]
Ganza	19[b]
Igorota	20[a]
L x PE	**
CV (a) %	10.59
CV (b) %	15.09

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

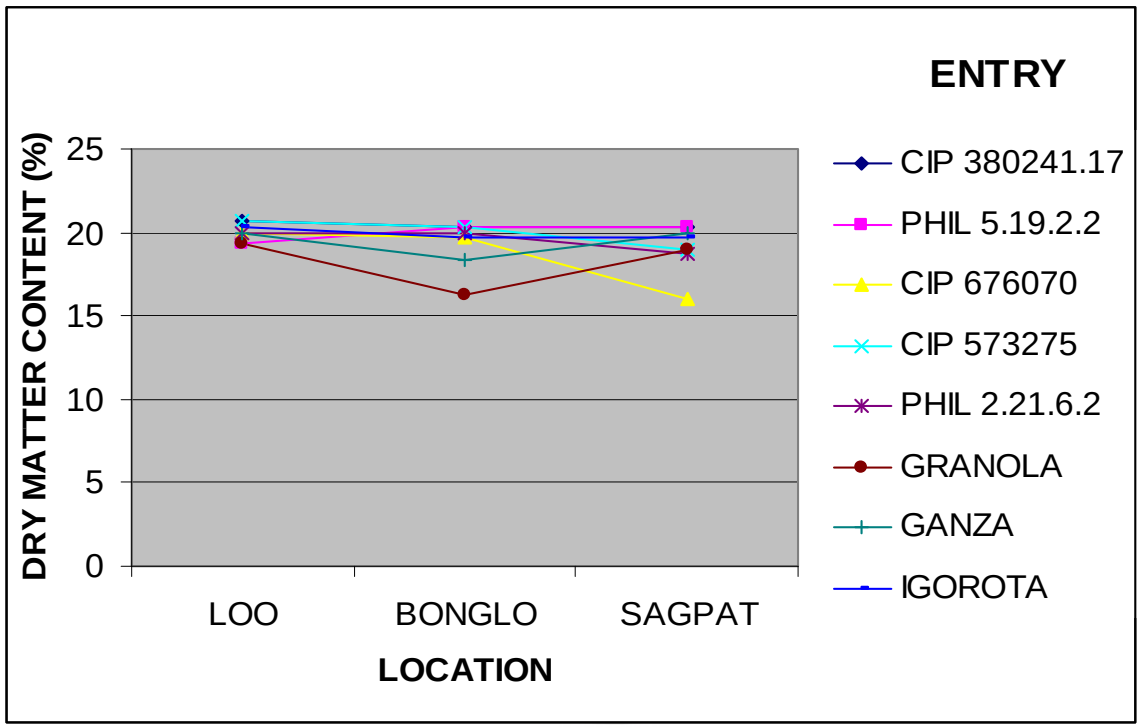

Figure 2. Interaction of location and potato entry on dry matter content of tubers

Sugar content (^{o}Brix)

Effect of location. Highly significant differences are observed on the sugar content of the potato tubers harvested from different locations (Table 3). Potato tubers harvested from Sagpat gave the highest sugar content while potato tubers from Bonglo gave the lowest sugar content.

Sugar content is a varietal characteristic that maybe influenced by environmental factors in a location (Peet, 2007). The low sugar content of the potatoes from Bonglo may be due to the high rainfall of the site.

Effect of entry. The potato entries significantly differed in terms of sugar content. The lowest sugar content was obtained from CIP 380241.17 and CIP 573275 but are not significantly different from the rest of the entries except Granola and CIP 676070. These entries with low sugar contents may be processed into fries with less browning.

The sugar content of the entries might be attributed to cultivar characteristics (Sanders, 2008).

Interaction effect. No interaction existed between the locations and entries. However, lowest sugar content was exhibited by PHIL 5.19.2.2 in Bonglo.

Table 3. Sugar content of potato entries harvested across locations

TREATMENT	SUGAR CONTENT (^{o}Brix)
Location (L)	
Loo	3.7[b]
Bonglo	2.5[c]
Sagpat	4.4[a]
Potato Entry (PE)	
CIP380241.17	3.2[b]
PHIL 5.19.2.2	3.4[a]
CIP 676070	3.7[a]
CIP 573275	3.2[b]
PHIL 2.21.6.2	4.1[a]
Granola	3.7[a]
Ganza	3.4[b]
Igorota	3.3[b]
L x PE	ns
CV (a) %	15.71
CV (b) %	17.80

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

Potato Fry yield

Effect of location. No significant differences are observed in the fry yield of potato tubers in each location (Table 4). Potato tubers harvested from Loo gave the highest fry yield.

Effect of entry. The tuber fry yield of the different entries (Fig. 3) was not significantly different from each other. However, the highest fry yield was obtained from CIP 573275, PHIL 2.21.6.2 and Igorota.

Interaction affect. No significant interaction exists between the locations and entries. The highest fry yield was observed in entries harvested from Loo.

Table 4. Fry yield of potato entries harvested across locations

TREATMENT	FRY YIELD (g)
Location (L)	
Loo	35
Bonglo	33
Sagpat	31
Potato Entry (PE)	
CIP 380241.17	33
PHIL 5.19.2.2	28
CIP 676070	32
CIP 573275	35
PHIL 2.21.6.2	35
Granola	32
Ganza	32
Igorota	35
L x PE	ns
CV (a) %	21.40
CV (b) %	35.60

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

(a) 96-06

(e) 2.21.6.2

(b) 5.19.2.2

(f) Granola

(c) 676070

(g) Ganza

(d) 573275

(f) Igorota

Figure 3. Tuber fry sticks of the eight potato entries

Potato Fry color

Effect of location. The color of the processed fries from each location showed no significant differences (Table 5). However, entries harvested from Loo and Sagpat produced yellow potato fries (rating 3) while those harvested from Bonglo produced light yellow fries (rating 2).

Effect of entry. Significant differences are observed in the color of the processed fries from the different entries. PHIL 5.19.2.2, PHIL 2.21.6.2 and Igorota produced light yellow fries while Ganza produced fries that are dark yellow with browning (Fig. 5).

The color of the potato fries maybe due to the sugar content of the tubers. The light yellow fries from PHIL 5.19.2.2 and Igorota may be attributed to their low sugar contents (3.4 and 3.3 ^{o}Brix, respectively). The relatively high sugar content of the other entries may have resulted to dark fry color (Mosley, 2005).

Interaction effect. A highly significant difference exists between the locations and potato entries (Fig. 4). Fries processed from Ganza harvested at Sagpat was dark yellow with browning while PHIL 5.19.2.2, CIP 380241.17 and Igorota harvested at Loo obtained a yellow fry color (Fig. 5). This result implies that both entries and location are important factors in selecting potatoes with light yellow to yellow fries.

Table 5. Fry color of potato entries harvested across locations

TREATMENT	FRY COLOR
Location (L)	
Loo	3
Bonglo	2
Sagpat	3
Potato Entries (PE)	
CIP 380241.17	3[b]
PHIL 5.19.2.2	2[c]
CIP 676070	3[b]
CIP 573275	3[b]
PHIL 2.21.6.2	2[c]
Granola	3[b]
Ganza	4[a]
Igorota	2[c]
L x PE	**
CV (a) %	19.12
CV (b) %	20.19

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

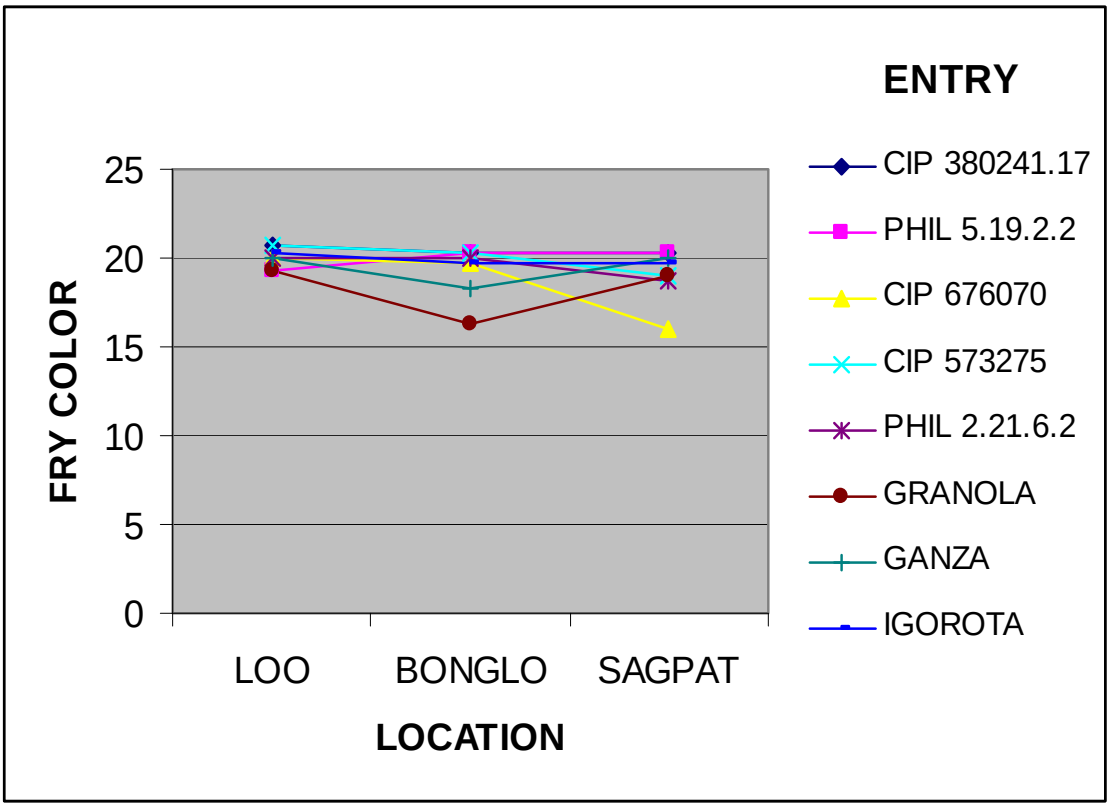

Figure 4. Interaction of location and potato entry on fry color

(a) rating 2 or light yellow

(b) rating 3 or yellow

(b) rating 4 or dark yellow

Figure 5. Processed fries showing the different color ratings

Fry Sugar End

Effect of location. Potato tubers harvested from Loo produced fries with sugar ends while those harvested from Bonglo and Sagpat had no sugar ends (Table 6).

The presence of sugar ends on the fries from Loo may be attributed to the relatively high sugar content of the tubers (Stark *et al*., 2001).

Effect of entry. Most of the entries had no sugar end (Fig. 7) except CIP 573275, CIP 380241.17 and Granola. The presence of sugar end in the potato fries of these entries (Fig. 6) maybe due to the sugar level of the potato tubers. Less than 0.125 % sugar of the tuber's fresh weight is required in processing to avoid color problems after cooking (Stark *et al.*, 2001).

In addition, the presence of sugar end which causes dark-end fries are unacceptable to processing and must be discarded.

Table 6. Sugar end of potato entries harvested across locations

TREATMENT	SUGAR END
Location (L)	
Loo	Present
Bonglo	Absent
Sagpat	Absent
Potato Entry (PE)	
CIP 380241.17	Present
PHIL 5.19.2.2	Absent
CIP 676070	Absent
CIP 573275	Present
PHIL 2.21.6.2	Absent
Granola	Present
Ganza	Absent
Igorota	Absent

Figure 6. Processed fries with sugar end

Figure 7. Processed fries without sugar end

Sensory Evaluation

Effect of location. The potato fries that were produced from the potatoes harvested from the different locations were moderately crispy, had moderately perceptible taste, were moderately oily, slightly firm, and slightly brown (Table 7). Dry matter content may influence the crispiness, oiliness and texture of the potato fries produced. On the other hand, sugar content of the tubers may influence taste and browning pattern of the fries.

Moreover, the fries that were produced from tubers harvested in Loo were liked much by the panelists which may be attributed to the color and sugar content of the fries. The fries of the tubers harvested in Bonglo and Sagpat were moderately liked by the panelists.

Effect of entry. Most of the potato fries of the different entries were slightly to moderately crispy, had moderately perceptible taste, were moderately oily, slightly firm, and slightly brown. Potato fries of the entries PHIL 5.19.2.2 and CIP 676070 were slightly oily which may be due to their relatively high dry matter contents. Varieties with high dry matter content concentration results in a low oil content (NIVAP, 2007).

PHIL 2.21.6.2 and Igorota produced fries which were liked much by the panelists. The acceptability of the fries maybe influenced by the sugar content of the tubers and color of the fries (Alingbas, 2007).

SUMMARY, CONCLUSION AND RECOMMENDATION

Summary

The study was conducted to identify the location that produces potato selections with the best fry quality, determine the potato entry with the best potato fry quality, and determine the interaction between locations and potato selection on fry quality.

Potato tubers harvested from the three locations had a dry matter content ranging from 19 to 20%. Loo gained the highest dry matter content while Bonglo and Sagpat gained the lowest. The highest sugar content was obtained from the potato tubers harvested from Sagpat.

Potato tubers from Bonglo produced light yellow fries with no sugar end. The fries produced from the three locations were moderately crispy, moderately perceptible, moderately oily, slightly firm, slightly brown and were liked moderately by the panelists. The fries from Loo were liked much.

CIP 380241.17, PHIL 5.19.2.2, CIP 573275, PHIL 2.21.6.2 and Igorota had the highest dry matter content. The high dry matter content of these entries resulted to high fry yield. Highest sugar content which was exhibited by PHIL 2.21.6.2, Granola, CIP 380241.17 and CIP 573275 resulted to sugar end on fries.

All entries produced fries with moderately perceptible taste, were slightly brown and slightly firm. Moderately crispy fries were also obtained from most of the entries except CIP 573275, PHIL 2.21.6.2 and Ganza which produced slightly crispy fries. PHIL 2.21.6.2 and Igorota were liked much by the panelists.

Interaction between the location and potato entries were highly significant on dry matter content, sugar end and potato fry color. No significant interactions were observed on sugar content and fry yield.

Conclusion

Loo is the best site to produce potato entries with the best fry quality. Potatoes harvested from Loo had dry matter contents acceptable for processing. Tubers from Loo also produced the highest fry yield and the fries were liked much by the panelists.

Tubers from PHIL 2.21.6.2 and Igorota showed good traits for fry quality. Both entries had high dry matter content and high fry yield. Moreover, processed fries from both entries were liked much by the panelists.

Growing PHIL 2.21.6.2 and Igorota in Loo might result in the production of tubers with good fry quality.

Recommendation

Based on the results, Loo, on the other hand, is recommended for producing potato selections suitable for fry processing.

CIP 2.21.6.2 and Igorota are recommended for potato fry processing because of their high fry yield, high dry matter content and acceptability.

Growing CIP 2.21.6.2 and Igorota in Loo is recommended for producing potatoes with good fry quality.

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APPENDICES

Appendix Table 1. Dry matter content (%) of the potato entries harvested across locations

TREATMENT	REPLICATION I	II	III	TOTAL	MEAN
L_I E_1	21	20	21	62	20.7
E_2	19	20	19	58	19.3
E_3	21	19	20	60	20.0
E_4	21	21	20	62	20.7
E_5	19	21	21	61	20.0
E_6	21	17	20	58	19.3
E_7	20	19	21	60	20.0
E_8	20	21	20	61	20.3
SUBTOTAL	162	158	162	482	161.3
L_2 E_1	21	20	20	61	20.3
E_2	21	19	21	61	20.3
E_3	19	21	19	59	19.7
E_4	21	20	20	61	20.3
E_5	20	20	20	60	20.0
E_6	16	15	18	49	16.3
E_7	19	18	18	55	18.3
E_8	19	21	19	59	19.7
SUBTOTAL	156	154	155	465	155
L_3 E_1	19	21	21	61	20.3
E_2	20	20	21	61	20.3
E_3	14	17	17	48	16.0
E_4	18	20	19	57	19.0
E_5	17	19	20	56	18.7
E_6	20	19	18	57	19.0
E_7	20	20	20	60	20.0
E_8	21	20	18	59	19.7
SUBTOTAL	149	156	154	459	152
TOTAL	467	468	472	1406	469

TWO-WAY TABLE

ENTRIES	LOCATIONS L1	L2	L3	TOTAL	MEAN
E_1	62.000	61.000	61.000	184	20.444
E_2	58.000	61.000	61.000	180	20.000
E_3	60.000	59.000	48.000	167	18.556
E_4	62.000	61.000	57.000	180	20.000
E_5	61.000	60.000	56.000	177	19.667
E_6	58.000	49.000	57.000	164	18.222
E_7	60.000	55.000	60.000	175	19.444
E_8	61.000	59.000	59.000	179	19.889
TOTAL	482.000	465.000	459.000	1406	
MEAN	20.083[a]	19.375[b]	19.125[b]		

ANALYSIS OF VARIANCE

SOURCE OF VARIATION	DEGREES OF FREEDOM	SUM OF SQUARES	MEAN SQUARE	COMPUTED F	TABULAR F 0.05	0.01
Replication	2	0.778	0.389			
Main-plot factor (A)	2	11.861	5.931	5.51**	3.22	5.15
Error (a)	4	4.306	1.076			
Subplot factor (B)	7	36.833	5.262	4.23**	2.59	3.80
A x B	14	51.917	3.708	2.98**	1.94	2.54
Error (b)	42	52.250	1.244			
TOTAL	71	157.944				

**Highly Significant

Coefficient of Variance (a): 10.59 %

Coefficient of Variance (b): 15.09 %

Appendix Table 2. Sugar content (^{o}Brix) of potato entries harvested across locations

TREATMENT	REPLICATION I	II	III	TOTAL	MEAN
L_I E_1	2.8	2.7	3.6	9.1	3.0
E_2	4.2	3.6	4.5	12.3	4.1
E_3	3.8	3.5	4.6	11.9	4.0
E_4	4.0	3.0	2.2	9.2	3.1
E_5	3.5	4.5	3.7	11.7	3.9
E_6	3.1	4.4	3.3	10.8	3.6
E_7	3.5	3.2	3.5	10.2	3.4
E_8	3.8	3.5	3.0	10.3	3.4
SUBTOTAL	28.7	28.4	28.4	85.5	28.5
L_2 E_1	2.6	2.4	2.8	7.8	2.6
E_2	1.5	2.3	2.5	6.3	2.1
E_3	3.7	2.0	1.9	7.6	2.5
E_4	1.4	3.1	2.1	6.6	2.2
E_5	3.2	3.5	4.5	11.2	3.7
E_6	3.4	2.6	2.0	8.0	2.7
E_7	1.8	2.0	2.7	6.5	2.2
E_8	3.1	1.6	1.8	6.5	2.2
SUBTOTAL	20.7	19.5	20.3	60.5	20.2
L_3 E_1	4.0	4.0	3.8	11.8	3.9
E_2	3.9	3.8	4.5	12.2	4.1
E_3	4.5	4.8	4.1	13.4	4.5
E_4	4.3	4.0	4.3	12.6	4.2
E_5	5.5	5.4	3.9	14.8	4.9
E_6	4.8	4.9	5.0	14.7	4.9
E_7	4.3	4.5	4.8	13.6	4.5
E_8	3.5	5.1	4.6	13.2	4.4
SUBTOTAL	34.8	36.5	35.0	106.2	35.4
TOTAL	84.2	84.4	83.7	252.2	84.1

TWO-WAY TABLE

	LOCATIONS				
ENTRIES	L1	L2	L3	TOTAL	MEAN
E_1	9.100	7.800	11.800	28.700	3.189
E_2	12.300	6.300	12.200	30.800	3.422
E_3	11.900	7.600	13.400	32.900	3.655
E_4	9.200	6.600	12.600	28.400	3.156
E_5	11.700	11.200	14.800	37.700	4.189
E_6	10.800	8.000	14.700	33.500	3.722
E_7	10.200	6.500	13.600	30.300	3.367
E_8	10.300	6.500	13.200	30.000	3.330
TOTAL	85.500	60.500	106.300	252.300	
MEAN	3.562^b	2.521^c	4.429^a		

ANALYSIS OF VARIANCE

SOURCE OF VARIATION	DEGREE OF FREEDOM	SUM OF SQUARES	MEAN SQUARE	COMPUTED F	TABULAR F 0.05	TABULAR F 0.01
Replication	2	0.011	0.005			
Main-plot factor (A)	2	43.823	21.912	286.6**	3.22	5.15
Error (a)	4	0.306	0.076			
Subplot factor (B)	7	7.335	1.048	2.69*	2.59	3.80
A x B	14	4.917	0.351	0.90^{ns}	1.94	2.54
Error (b)	42	16.337	0.389			
TOTAL	71	72.729				

**Highly Significant

*Significant

ns not significant

Coefficient of Variance (a): 15.71 %

Coefficient of Variance (b): 17.80 %

Appendix Table 3. Fry yield (g) of potato entries harvested across locations

TREATMENT	REPLICATION I	II	III	TOTAL	MEAN
L_I E_1	37	39	38	114	38.0
E_2	25	47	21	93	31.0
E_3	39	41	39	119	39.7
E_4	39	47	32	119	39.7
E_5	34	40	32	106	35.3
E_6	34	21	40	94	31.3
E_7	27	34	40	101	33.7
E_8	32	34	28	94	31.3
SUBTOTAL	264	303	272	920	35
L_2 E_1	26	29	26	81	27
E_2	24	44	18	86	28.7
E_3	27	28	38	93	31
E_4	33	31	43	105	35
E_5	29	32	48	109	36.3
E_6	32	33	42	108	36
E_7	40	26	30	95	31.7
E_8	40	36	29	105	35
SUBTOTAL	250	260	275	39	32.58
L_3 E_1	29	39	33	101	33.7
E_2	27	23	26	76	25.3
E_3	26	20	29	75	25
E_4	41	21	30	91	30.3
E_5	33	35	36	103	34.3
E_6	31	28	24	83	47.8
E_7	27	29	34	90	30
E_8	31	37	48	116	38.7
SUBTOTAL	11	13	13	37	30.6
TOTAL	840	782	735	2357	

TWO-WAY TABLE

ENTRIES	LOCATIONS L1	L2	L3	TOTAL	MEAN
E_1	114.000	81.000	101.000	296.000	32.889
E_2	93.000	86.000	76.000	255.000	28.333
E_3	119.000	93.000	75.000	287.000	31.889
E_4	119.000	105.000	91.000	315.000	35.000
E_5	106.000	109.000	103.000	318.000	35.333
E_6	94.000	108.000	83.0000	285.000	31.667
E_7	101.000	95.000	90.000	286.000	31.778
E_8	94.000	105.000	116.000	315.000	35.000
TOTAL	840.000	782.000	735.000	2357.000	
MEAN	35.000	32.583	30.625		

ANALYSIS OF VARIANCE

SOURCE OF VARIATION	DEGREE OF FREEDOM	SUM OF SQUARES	MEAN SQUARE	COMPUTED F	TABULAR F 0.05	0.01
Replication	2	35.528	17.764			
Main-plot factor (A)	2	230.528	115.264	3.21^{ns}	3.22	5.15
Error (a)	4	136.806	34.201			
Subplot factor (B)	7	352.653	50.379	1.03^{ns}	2.59	3.80
A x B	14	670.806	47.915	0.98^{ns}	1.94	2.54
Error (b)	42	2061.667	49.087			
TOTAL	71	3487.986				

ns=not significant

Coefficient of Variance (a): 21.40%

Coefficient of Variance (b): 35.60%

Appendix Table 4. Fry color of the potato entries harvested across locations

TREATMENT	REPLICATION I	II	III	TOTAL	MEAN
L_I E_1	1	1	1	3	1.0
E_2	1	1	1	3	1.0
E_3	4	4	4	12	4.0
E_4	4	4	4	12	4.0
E_5	4	4	1	9	3.0
E_6	2	5	5	12	4.0
E_7	1	2	6	9	3.0
E_8	1	1	1	3	1.0
SUBTOTAL	18	22	23	63	21.0
L_2 E_1	4	1	1	6	2.0
E_2	4	1	2	7	2.3
E_3	2	2	2	6	2.0
E_4	1	4	4	9	3.0
E_5	1	1	1	3	1.0
E_6	4	5	4	13	4.3
E_7	1	4	1	6	2.0
E_8	1	1	4	6	2.0
SUBTOTAL	18	19	19	56	18.7
L_3 E_1	4	5	5	14	4.7
E_2	4	2	2	8	2.7
E_3	4	3	2	9	3.0
E_4	3	3	1	7	2.3
E_5	1	4	4	9	3.0
E_6	2	1	2	5	1.7
E_7	5	7	5	17	5.7
E_8	1	4	1	6	2.0
SUBTOTAL	24	29	22	75	25
TOTAL	60	70	64	194	64.7

TWO-WAY TABLE

	LOCATIONS				
ENTRIES	L1	L2	L3	TOTAL	MEAN
E_1	3	6	14	23	3
E_2	3	7	8	18	2
E_3	12	6	9	27	3
E_4	12	9	7	28	3
E_5	9	3	9	21	2
E_6	12	13	5	30	3
E_7	9	6	17	32	4
E_8	3	6	6	15	2
TOTAL	63	56	75	194	
MEAN	3	2	3		

ANALYSIS OF VARIANCE

SOURCE OF VARIATION	DEGREES OF FREEDOM	SUM OF SQUARES	MEAN SQUARE	COMPUTED F	TABULAR F 0.05	TABULAR F 0.01
Replication	2	2.111	1.056			
Main-plot factor (A)	2	7.694	3.847	5.18^{ns}	6.94	18.00
Error (a)	4	2.972	0.743			
Subplot factor (B)	7	27.944	3.992	2.28*	2.24	3.26
A x B	14	72.972	5.212	2.97**	1.94	2.54
Error (b)	42	73.583	1.752			
TOTAL	71	157.944				

ns not significant

*Significant

**Highly Significant

Coefficient of Variance (a): 19.12 %

Coefficient of Variance (b): 28.12 %

Appendix Table 5. Fry sugar ends of the potato entries harvested across locations

TREATMENT	REPLICATION I	II	III	TOTAL	MEAN
L_I E_1	1	1	1	3	1
E_2	2	2	2	6	2
E_3	1	1	1	3	1
E_4	2	2	2	6	2
E_5	1	2	2	5	2
E_6	1	1	1	3	1
E_7	1	1	1	3	1
E_8	1	2	5	5	2
SUBTOTAL	10	12	12	34	11
L_2 E_1	1	2	1	4	1
E_2	2	2	2	6	2
E_3	2	2	2	6	2
E_4	1	2	1	4	1
E_5	1	2	1	4	1
E_6	1	1	1	3	1
E_7	2	2	2	6	2
E_8	2	2	2	6	2
SUBTOTAL	12	15	12	39	13
L_3 E_1	1	1	1	3	1
E_2	2	2	2	2	2
E_3	2	2	2	6	2
E_4	1	1	1	3	1
E_5	1	2	2	5	2
E_6	1	1	1	3	1
E_7	2	2	2	6	2
E_8	1	2	2	5	2
SUBTOTAL	11	13	13	37	12
TOTAL	33	40	39	110	36

TWO-WAY TABLE

ENTRIES	LOCATIONS L1	L2	L3	TOTAL	MEAN
E_1	3.000	4.000	3.000	10.000	1.111[c]
E_2	6.000	6.000	6.000	18.000	2.000[a]
E_3	3.000	6.000	6.000	15.000	1.667[ab]
E_4	6.000	4.000	3.000	13.000	1.444[bc]
E_5	5.000	4.000	5.000	14.000	1.556[ab]
E_6	3.000	3.000	3.000	9.000	1.000[c]
E_7	3.000	6.000	6.000	15.000	1.667[ab]
E_8	5.000	6.000	5.000	16.000	1.778[ab]
TOTAL	34.000	39.000	37	110.000	
MEAN	1.417	1.625	1.542		

ANALYSIS OF VARIANCE

SOURCE OF VARIATION	DEGREE OF FREEDOM	SUM OF SQUARES	MEAN SQUARE	COMPUTED F	TABULAR F 0.05	0.01
Replication	2	1.028	0.514			
Main-plot factor (A)	2	0.528	0.264	2.71[ns]	3.22	5.15
Error (a)	4	0.389	0.097			
Subplot factor (B)	7	7.056	1.008	13.03**	2.59	3.80
A x B	14	5.694	0.407	5.26**	1.94	2.54
Error (b)	42	3.250	0.077			
TOTAL	71	17.944				

**Highly significant

ns=not significant

Coefficient of Variance (a): 14.20%

Coefficient of Variance (b): 18.21 %

Appendix Table 6a. Crispiness of potato entries harvested across locations

	PANELIST											
TREATMENT	1	2	3	4	5	6	7	8	9	10	TOTAL	MEAN
L_I E_1	4	4	3	3	3	3	3	3	3	2	31	3.1
E_2	4	4	3	3	3	2	4	3	3	3	32	3.2
E_3	4	3	2	3	2	3	3	3	2	2	27	2.7
E_4	5	3	4	3	4	4	4	3	4	4	38	3.8
E_5	3	3	4	3	2	3	5	2	3	3	31	3.1
E_6	4	4	5	3	4	4	4	4	4	4	40	4.0
E_7	5	4	5	5	4	4	5	3	4	3	42	4.2
E_8	5	3	3	5	3	2	3	2	2	4	32	3.2
SUBTOTAL	34	28	29	28	25	25	31	23	25	25	273	27.3
L2 E_1	5	2	3	2	3	2	4	1	2	2	26	2.6
E_2	4	2	4	3	4	3	4	1	3	3	31	3.1
E_3	4	2	2	3	3	2	4	1	4	3	28	2.8
E_4	5	4	3	4	4	3	4	1	4	3	35	3.5
E_5	4	3	4	4	4	4	4	2	4	3	36	3.6
E_6	4	2	2	3	2	2	2	2	3	2	24	2.4
E_7	4	4	2	3	4	3	3	1	4	2	30	3.0
E_8	4	2	3	4	2	3	4	2	4	3	31	3.1
SUBTOTAL	34	21	23	26	26	22	29	11	28	21	241	24.1
L2 E_1	4	4	4	4	3	2	4	3	4	5	37	3.7
E_2	5	4	5	3	3	3	4	3	4	5	39	3.9
E_3	4	3	5	4	3	3	3	2	3	5	35	3.5
E_4	4	4	5	3	3	3	3	3	3	4	35	3.5
E_5	5	4	5	4	3	3	4	3	5	4	40	4.0
E_6	5	3	2	2	1	2	2	2	3	2	24	2.4
E_7	5	4	5	4	4	2	3	3	4	4	38	3.8
E_8	5	2	2	2	2	3	2	2	2	3	25	2.5
SUBTOTAL	37	28	33	26	22	21	25	21	28	32	273	27.3
TTOTAL	105	77	85	80	73	68	85	55	81	78	787	78.7

TWO-WAY TABLE

	LOCATIONS				
ENTRIES	L1	L2	L3	TOTAL	MEAN
E_1	31.000	26.000	37.000	94.000	3.133[b]
E_2	32.000	31.000	39.000	102.000	3.400[ab]
E_3	27.000	28.000	35.000	90.000	3.000[b]
E_4	38.000	35.000	35.000	108.000	3.600[a]
E_5	31.000	36.000	40.000	107.000	3.567[a]
E_6	40.000	24.000	24.000	88.000	2.933[b]
E_7	42.000	30.000	38.000	110.000	3.667[a]
E_8	32.000	31.000	25.000	88.000	2.933[b]
TOTAL	273.000	241.000	273.000	787.000	
MEAN	3.413	3.013	3.413		

ANALYSIS OF VARIANCE

SOURCE OF VARIATION	DEGREE OF FREEDOM	SUM OF SQUARES	MEAN SQUARE	COMPUTED F	TABULAR F 0.05	TABULAR F 0.01
Replication	9	62.087	6.899			
Main-plot factor (A)	2	8.533	4.267	2.92ns	3.05	4.72
Error (a)	18	26.300	1.461			
Subplot factor (B)	7	20.662	2.952	7.20**	2.06	2.74
A x B	14	37.200	2.657	6.48**	1.75	2.18
Error (b)	189	77.513	0.410			
TOTAL	239	232.296				

**Highly Significant

ns= not significant

Coefficient of Variance (a): 19.53%

Coefficient of Variance (b): 22.83 %

Appendix Table 6b. Taste of potato entries harvested across locations

	PANELIST											
TREATMENT	1	2	3	4	5	6	7	8	9	10	TOTAL	MEAN
L_I E_1	2	2	2	2	3	3	2	3	3	3	24	2.4
E_2	3	3	2	3	3	2	3	2	3	3	28	2.8
E_3	2	2	2	3	2	2	3	2	2	2	22	2.2
E_4	2	3	3	3	4	3	3	2	4	2	29	2.9
E_5	4	2	3	4	2	3	4	2	3	2	29	2.9
E_6	3	2	3	3	3	3	2	4	4	3	30	3.0
E_7	2	3	5	3	4	4	3	3	3	3	33	3.3
E_8	2	3	4	4	3	3	4	2	2	3	30	3.0
SUBTOTAL	20	20	24	25	24	23	24	20	24	21	225	22.5
L2 E_1	1	2	2	2	3	3	2	3	3	3	24	2.4
E_2	2	3	2	3	3	2	3	2	3	3	28	2.8
E_3	2	2	2	3	2	2	3	2	2	2	22	2.2
E_4	1	3	3	4	4	3	3	2	4	2	29	2.9
E_5	1	2	3	4	2	3	4	2	3	2	29	2.9
E_6	1	2	3	3	3	3	2	4	4	3	30	3.0
E_7	2	3	5	3	4	4	3	3	3	3	33	3.3
E_8	2	3	4	4	3	3	4	2	2	3	30	3.0
SUBTOTAL	31	22	21	20	15	21	24	15	29	17	215	21.5
L2 E_1	1	2	2	2	3	3	2	3	3	3	24	3.7
E_2	2	3	2	3	3	2	3	2	3	3	28	3.9
E_3	2	2	2	3	2	2	3	2	2	2	22	3.5
E_4	1	3	3	3	4	3	3	2	4	2	29	3.5
E_5	1	2	3	4	2	3	4	2	3	2	29	4.0
E_6	1	2	3	3	3	3	2	4	4	3	30	2.4
E_7	2	3	5	3	4	4	3	3	3	3	33	3.8
E_8	2	3	4	4	3	3	4	2	2	3	30	2.5
SUBTOTAL	27	21	21	21	20	15	24	20	28	28	225	22.5
TOTAL	74	63	66	66	59	59	72	55	81	66	665	

TWO-WAY TABLE

ENTRIES	LOCATIONS L1	L2	L3	TOTAL	MEAN
E_1	25.000	24.000	28.000	77.000	2.567[ab]
E_2	27.000	25.000	29.000	81.000	2.700[ab]
E_3	22.000	28.000	27.000	77.000	2.567[ab]
E_4	29.000	33.000	32.000	94.000	3.133[a]
E_5	29.000	28.000	32.000	89.000	2.967[ab]
E_6	30.000	24.000	21.000	75.000	2.500[b]
E_7	33.000	26.000	31.000	90.000	3.000[a]
E_8	30.000	27.000	25.000	82.000	2.733[ab]
TOTAL	225.000	215.000	225.000	665.000	
MEAN	2.813	2.688	2.813		

ANALYSIS OF VARIANCE

SOURCE OF VARIATION	DEGREE OF FREEDOM	SUM OF SQUARES	MEAN SQUARE	COMPUTED F	TABULAR F 0.05	0.01
Replication	9	26.271	2.919			
Main-plot factor (A)	2	0.833	0.417	0.24ns	3.05	4.72
Error (a)	18	30.667	1.704			
Subplot factor (B)	7	11.563	1.652	4.31**	2.05	2.74
A x B	14	12.700	0.907	2.37**	1.75	2.18
Error (b)	189	72.362	0.383			
TOTAL	239	154.396				

**Highly Significant

ns= not significant

Coefficient of Variance (a): 22.33 %

Coefficient of Variance (b): 15.69 %

Appendix Table 6c. Oiliness of potato entries harvested across locations

	PANELIST											
TREATMENT	1	2	3	4	5	6	7	8	9	10	TOTAL	MEAN
L_I E_1	4	4	2	4	4	3	4	4	3	3	35	3.5
E_2	4	4	2	3	4	2	2	3	4	3	31	3.1
E_3	3	4	3	3	2	3	3	3	2	4	30	3.0
E_4	3	4	2	4	3	3	2	2	3	43	29	2.9
E_5	4	4	2	4	4	2	4	3	4	2	33	3.3
E_6	4	4	4	4	3	4	4	3	3	2	35	3.5
E_7	2	3	3	3	3	2	1	4	2	2	25	2.5
E_8	3	3	3	3	2	2	2	3	3	3	27	2.7
SUBTOTAL	28	26	21	23	25	20	24	25	24	21	244	24.4
L2 E_1	4	5	3	1	2	2	2	1	3	3	26	2.6
E_2	3	4	4	2	2	2	2	2	3	3	27	2.7
E_3	4	4	2	4	3	2	3	2	4	3	31	3.1
E_4	3	4	2	4	3	3	2	2	3	3	29	2.9
E_5	4	4	4	4	3	2	3	3	4	3	34	3.4
E_6	4	4	3	3	2	3	3	3	3	3	31	3.1
E_7	3	4	1	2	2	3	2	2	3	3	25	2.5
E_8	3	4	2	4	4	3	3	3	4	3	33	3.3
SUBTOTAL	28	33	21	24	21	20	20	18	27	24	236	23.6
L2 E_1	2	3	2	3	3	4	4	3	3	4	31	3.1
E_2	2	2	2	3	2	4	3	3	3	4	28	2.8
E_3	2	3	3	4	2	4	3	2	3	4	30	3.0
E_4	4	3	3	2	2	3	3	4	3	4	31	3.1
E_5	4	4	5	4	2	3	4	3	3	4	36	3.6
E_6	5	4	2	2	1	4	1	1	2	2	24	2.4
E_7	3	3	2	2	1	3	2	3	3	3	25	3.5
E_8	5	3	4	4	3	4	2	2	2	4	33	3.3
SUBTOTAL	27	25	26	24	16	29	22	21	22	29	238	23.8
TOTAL	83	84	65	71	62	69	66	64	73	74	718	71.8

TWO-WAY TABLE

	LOCATIONS				
ENTRIES	L1	L2	L3	TOTAL	MEAN
E_1	35.000	26.000	31.000	92.000	3.067
E_2	31.000	27.000	28.000	86.000	2.867
E_3	30.000	31.000	30.000	91.000	3.033
E_4	33.000	29.000	31.000	93.000	3.100
E_5	28.000	34.000	36.000	98.000	3.267
E_6	35.000	31.000	24.000	90.000	3.000
E_7	25.000	25.000	25.000	75.000	2.500
E_8	27.000	33.000	33.000	93.000	3.100
TOTAL	244.000	236.000	238.000	728.000	
MEAN	3.050	2.950	2.975		

ANALYSIS OF VARIANCE

SOURCE OF VARIATION	DEGREE OF FREEDOM	SUM OF SQUARES	MEAN SQUARE	COMPUTED F	TABULAR F 0.05	TABULAR F 0.01
Replication	9	25.733	2.859			
Main-plot factor (A)	2	0.433	0.217	0.15^{ns}	3.05	4.72
Error (a)	18	26.317	1.462			
Subplot factor (B)	7	10.917	1.560	2.01^{ns}	2.05	2.74
A x B	14	17.433	1.245	2.33^{**}	1.75	2.18
Error (b)	189	101.150	0.535			
TOTAL	239	181.983				

**Highly Significant

ns= not significant

Coefficient of Variance (a): 24.45 %

Coefficient of Variance (b): 18.39 %

Appendix Table 6d. Texture of potato entries harvested across locations

	PANELIST											
TREATMENT	1	2	3	4	5	6	7	8	9	10	TOTAL	MEAN
L_I E_1	4	2	2	3	2	2	1	3	3	3	25	2.5
E_2	2	3	1	3	2	1	1	3	2	2	20	2.0
E_3	2	2	2	2	2	2	3	3	2	3	23	2.3
E_4	4	2	1	4	3	3	1	3	3	4	28	3.8
E_5	3	3	1	3	2	3	2	2	3	3	25	2.5
E_6	3	3	1	4	3	4	3	4	3	3	31	3.1
E_7	3	3	2	3	2	3	3	3	2	4	28	2.8
E_8	2	3	4	4	3	3	4	2	2	3	27	3.7
SUBTOTAL	25	20	12	25	19	20	16	23	21	25	207	20.7
L2 E_1	4	2	3	3	3	2	3	1	2	3	26	2.6
E_2	3	3	4	3	2	2	3	2	3	3	27	2.7
E_3	3	2	3	2	2	2	3	2	3	2	24	2.4
E_4	3	2	3	1	3	2	3	2	3	3	25	2.5
E_5	3	3	3	2	3	2	3	2	3	2	26	2.6
E_6	3	2	3	3	3	2	2	2	2	2	24	2.4
E_7	2	4	2	1	4	2	3	1	2	2	23	2.3
E_8	3	2	2	2	2	2	3	2	4	3	25	2.5
SUBTOTAL	24	20	23	18	21	16	23	14	22	19	200	20.0
L2 E_1	3	3	3	2	2	2	2	3	3	3	26	2.6
E_2	2	3	2	2	2	1	3	3	3	4	25	2.5
E_3	3	3	1	2	2	2	3	2	3	3	24	2.4
E_4	4	3	3	4	3	3	3	3	2	3	31	3.1
E_5	4	3	2	3	2	3	3	3	3	3	27	2.7
E_6	4	3	1	2	2	2	2	1	3	1	21	2.1
E_7	4	3	3	2	3	2	3	3	3	3	29	2.9
E_8	4	2	3	3	2	3	2	2	2	3	26	2.6
SUBTOTAL	28	23	18	20	18	18	19	20	22	23	209	20.9
TOTAL	83	87	65	75	62	69	66	64	73	74		

TWO-WAY TABLE

	LOCATIONS				
ENTRIES	L1	L2	L3	TOTAL	MEAN
E_1	25.000	26.000	26.000	77.000	2.567
E_2	20.000	27.000	25.000	72.000	2.400
E_3	23.000	24.000	24.000	71.000	2.367
E_4	28.000	25.000	31.000	84.000	2.800
E_5	25.000	26.000	27.000	78.000	2.600
E_6	31.000	24.000	21.000	76.000	2.533
E_7	28.000	23.000	29.000	80.000	3.667
E_8	27.000	25.000	26.000	78.000	2.600
TOTAL	207.000	200.000	209.000	616.000	
MEAN	2.588	2.500	2.613		

ANALYSIS OF VARIANCE

SOURCE OF VARIATION	DEGREE OF FREEDOM	SUM OF SQUARES	MEAN SQUARE	COMPUTED F	TABULAR F 0.05	TABULAR F 0.01
Replication	9	18.850	2.094			
Main-plot factor (A)	2	0.558	0.279	0.20^{ns}	3.05	4.72
Error (a)	18	25.525	1.418			
Subplot factor (B)	7	4.067	0.581	1.52**	2.05	2.74
A x B	14	11.708	0.836	2.19**	1.75	2.18
Error (b)	189	72.225	0.382			
TOTAL	239	132.933				

**Highly Significant

ns= not significant

Coefficient of Variance (a): 24.08%

Coefficient of Variance (b): 15.43%

Appendix Table 6e. Browning of potato entries harvested across locations

	PANELIST											
TREATMENT	1	2	3	4	5	6	7	8	9	10	TOTAL	MEAN
L_I E_1	2	3	3	2	3	2	4	3	3	4	29	2.9
E_2	3	2	2	3	2	3	3	3	2	2	25	2.5
E_3	3	3	2	2	2	3	2	3	3	3	26	2.6
E_4	2	3	3	3	3	2	3	2	3	3	27	3.7
E_5	2	2	2	2	2	2	2	2	3	2	21	2.1
E_6	2	2	3	3	2	3	2	3	2	3	25	2.5
E_7	1	3	2	3	3	3	4	2	2	3	26	2.6
E_8	3	2	2	3	3	4	3	3	2	2	27	2.7
SUBTOTAL	18	20	19	21	20	22	23	21	20	22	206	20.6
L2 E_1	3	3	3	3	3	2	3	2	3	2	27	2.7
E_2	3	2	3	3	2	2	3	1	1	2	22	2.2
E_3	3	4	4	2	3	3	3	3	2	2	29	2.9
E_4	4	3	3	3	3	2	2	2	3	1	26	2.6
E_5	2	3	4	3	3	2	3	2	3	3	28	2.8
E_6	3	3	3	3	3	3	2	2	3	2	27	2.7
E_7	2	3	2	2	2	3	3	3	4	3	27	2.7
E_8	3	1	1	1	3	3	1	2	3	4	22	2.2
SUBTOTAL	23	22	23	20	22	20	20	17	22	19	208	20.8
L2 E_1	3	2	3	3	3	3	2	3	3	3	28	2.8
E_2	3	3	3	3	2	3	3	3	3	3	29	2.9
E_3	4	3	4	3	2	2	3	3	1	2	28	2.8
E_4	3	4	3	2	3	2	3	4	3	4	31	3.1
E_5	1	1	2	1	2	3	4	3	3	4	24	2.4
E_6	4	3	2	3	4	2	1	1	2	1	23	2.3
E_7	2	3	3	1	4	2	3	1	3	3	25	2.5
E_8	2	2	2	2	3	2	2	2	2	2	21	2.1
SUBTOTAL	22	21	22	18	23	19	21	20	22	21	209	20.9
TOTAL	63	63	64	59	65	61	64	58	64	62	623	62.3

TWO-WAY TABLE

	LOCATIONS				
ENTRIES	L1	L2	L3	TOTAL	MEAN
E_1	29.000	27.000	28.000	84.000	2.800
E_2	25.000	22.000	29.000	76.000	2.533
E_3	26.000	29.000	28.000	83.000	2.767
E_4	27.000	26.000	31.000	84.000	2.800
E_5	21.000	28.000	24.000	73.000	2.433
E_6	25.000	27.000	23.000	75.000	2.500
E_7	26.000	27.000	25.000	78.000	3.600
E_8	27.000	22.000	21.000	70.000	2.333
TOTAL	206.000	208.000	209.000	665.000	
MEAN	2.575	2.600	2.613		

ANALYSIS OF VARIANCE

SOURCE OF VARIATION	DEGREE OF FREEDOM	SUM OF SQUARES	MEAN SQUARE	COMPUTED F	TABULAR F 0.05	TABULAR F 0.01
Replication	9	2.044	2.223			
Main-plot factor (A)	2	0.058	0.027	0.07^{ns}	3.05	4.72
Error (a)	18	7.358	0.409			
Subplot factor (B)	7	6.629	0.947	1.72^{ns}	2.05	2.74
A x B	14	10.008	0.715	1.30^{ns}	1.75	2.18
Error (b)	189	103.738	0.549			
TOTAL	239	154.396				

ns= not significant

Coefficient of Variance (a): 28.54 %

Coefficient of Variance (b): 17.26 %

Appendix Table 6f. General acceptability of potato entries harvested across locations

	PANELIST											
TREATMENT	1	2	3	4	5	6	7	8	9	10	TOTAL	MEAN
L_I E_1	3	3	2	2	2	3	3	3	4	4	29	2.9
E_2	1	1	3	4	2	2	4	2	3	2	24	2.4
E_3	1	1	2	2	2	3	4	2	2	2	21	2.1
E_4	3	2	5	4	3	3	5	2	3	3	33	3.3
E_5	4	3	3	3	2	3	4	1	3	3	29	2.9
E_6	2	3	3	3	3	5	4	3	2	4	32	3.2
E_7	2	4	4	3	4	4	5	3	3	3	35	3.5
E_8	4	2	4	4	3	2	3	4	2	2	30	3.0
SUBTOTAL	20	19	26	25	21	25	32	20	22	23	233	23.3
L2 E_1	4	2	2	1	2	3	3	1	3	3	24	2.4
E_2	4	1	3	2	1	4	4	1	3	1	24	2.4
E_3	3	1	3	3	1	2	2	3	4	1	23	2.3
E_4	4	3	2	2	2	2	1	2	4	2	24	2.4
E_5	3	1	3	3	2	3	3	2	4	2	26	2.6
E_6	4	2	3	1	1	3	3	2	3	1	23	2.3
E_7	3	2	2	1	2	4	2	1	2	1	20	2.0
E_8	3	3	3	2	2	3	3	1	4	2	26	2.6
SUBTOTAL	28	15	21	15	13	24	21	13	27	13	190	19.0
L2 E_1	3	3	2	3	2	3	3	4	4	3	30	3.0
E_2	4	3	4	4	3	3	4	4	3	4	36	3.6
E_3	3	2	3	3	3	2	3	3	1	4	27	2.7
E_4	5	3	5	4	4	3	4	2	2	2	35	3.5
E_5	4	3	3	3	3	2	4	3	3	4	32	3.2
E_6	5	4	2	1	4	4	1	4	1	1	27	2.7
E_7	5	3	4	2	2	3	3	2	3	3	30	3.0
E_8	5	2	3	4	2	3	3	3	2	3	30	3.0
SUBTOTAL	34	24	26	24	23	23	25	25	19	24	247	24.7
TOTAL	82	58	73	64	57	72	78	58	68	60	670	67.0

TWO-WAY TABLE

ENTRIES	LOCATIONS L1	L2	L3	TOTAL	MEAN
E_1	29.000	24.000	30.000	83.000	2.767
E_2	24.000	24.000	36.000	84.000	2.800
E_3	21.000	23.000	27.000	71.000	2.367
E_4	33.000	24.000	35.000	92.000	3.067
E_5	29.000	26.000	32.000	87.000	2.900
E_6	32.000	23.000	27.000	82.000	2.733
E_7	35.000	20.000	30.000	85.000	3.833
E_8	30.000	26.000	30.000	86.000	2.867
TOTAL	233.000	190.000	247.000	670.000	
MEAN	2.913^a	2.375^b	3.088^a		

ANALYSIS OF VARIANCE

SOURCE OF VARIATION	DEGREE OF FREEDOM	SUM OF SQUARES	MEAN SQUARE	COMPUTED F	TABULAR F 0.05	0.01
Replication	9	30.333	3.370			
Main-plot factor (A)	2	22.058	11.029	4.68*	3.05	4.75
Error (a)	18	42.442	2.358			
Subplot factor (B)	7	8.383	1.198	1.72^{ns}	2.05	2.74
A x B	14	16.942	1.210	1.74^{ns}	1.75	2.18
Error (b)	189	131.425	0.695			
TOTAL	239	151.583				

*Significant

ns= not significant

Coefficient of Variance (a): 29.87 %

Coefficient of Variance (b): 18.43 %