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POTATO GERMPLASM FOR ORGANIC PRODUCTION (I): AGRONOMIC CHARACTERS IN THE MID-MOUNTAIN ZONE OF BENGUET

ABSTRACT

Organic potato production would be profitable if varieties planted are adapted to low input conditions and tolerant to diseases and insects, thus, the need to select varieties under such conditions.

Potato accessions from different sources were evaluated in different production sites representing the mid-mountain zone of Benguet (1,300-2,000 m above sea level) in 2005-2006. Using a modified evaluation scheme, potato accessions have undergone a series of evaluation based on agronomic characters such as yield, resistance to late blight and canopy cover.

Out of 55 potato accessions evaluated during the preliminary trial at the BSU organic farm, 15 accessions were selected. Multilocation trials of the 15 accessions were conducted in four production sites with elevations ranging from 1,336 to 1,638 m above sea level.

Potato accessions CIP 13.1.1, CIP 676089, CIP 380251.17, BSU 5.19.2.2 and CIP 676070 produced the highest tuber yield per hill across locations and planting seasons. These accessions also showed resistance to late blight in all production sites.

The result suggests that organic production of potato is feasible with the use of suitable potato accessions which may eventually lead to sustain-*able production in the Philippine highlands.*

INTRODUCTION

Potato is an important commercial vegetable crop in Benguet and some parts of Mountain Province (HARRDEC, 1996). The demand for potatoes is increasing due to rise in number of fast-food chains, hotels, and pre-service of local potato-based snacks food manufacturers. At present, maximum production is not reached due to various factors. One major con-straint is poor quality varieties which are low yielding and susceptible to pests.

Organically grown potatoes may offer greater market potential compared to the conventionally grown potatoes. At present, organically grown vegetables including potatoes are in demand due to the increasing aware-ness of pesticide hazards to the environment and human health. Consumers are becoming aware that "chemical-free vegetables" are best and are willing to pay higher price if these are available. Organic production of vegetables is highly specialized but a number of farmers have successfully ventured into it. Interviews have shown that organically grown vegetables including potatoes demand higher price than conventionally produced ones.

Potato was reported as the most chemically sprayed crop among the vegetables grown in the Philippine highlands (Ganga, 2001). Potato produc-tion in the locality is not globally competitive because of high production cost. A bigger portion of the cost is used for pesticides. This problem could be solved through the use of resistant varieties adapted to local conditions and organic farming.

The study aimed to determine the agronomic characters of potato accessions and to evaluate and select potato accessions suitable for organic production in the mid-mountain zone of Benguet.

MATERIALS AND METHODS

Preliminary evaluation of potato accessions for organic production

Potato Accessions. The 55 potato accessions used in this study were acquired by the Northern Philippines Root Crops Research and Training

Center (NPRCRTC) from Peru, Korea, Japan, U.S.A, Australia and Philippines.

Land Preparation and Layout of the Experimental Area. An area (825 m2) designated for organic production was thoroughly prepared and divided into three blocks. Each block was subdivided into 55 plots measuring 1 m x 5 m. The experiment was laid-out following the randomized complete block design (RCBD) with three replications.

Preparation of Planting Materials and Planting. Rooted stem cuttings were planted using 30 cuttings per treatment/replication at a distance of 25 cm x 30 cm between hills and rows.

Cultural Management Practices. The treatments were equally ap-plied with compost at a rate of 10 kg/5 m2. Cultural practices such as irriga-tion and weeding were uniformly employed in all the treatments. There was no spraying of pesticides, instead yellow plastics traps were used for leaf miner control. The area was surrounded with corn and marigold to encour-age diversity.

Multilocation trials in representative production sites of the mid-mountain zone of Benguet

Experimental Sites

The trials were conducted in four farms from October 2005 to March 2006 (Table 1).

Table 1. Elevation of production sites

PRODUCTION SITE	ELEVATION (m asl)
Balili, La Trinidad	1,336
Puguis, La Trinidad	1,342
Loo, Buguias	1,638
Cabutotan, Bakun	1,588

Treatments

Fifteen accessions selected from the preliminary trial were planted in the four production sites (Table 2).

Table 2. Potato accessions, their sources and some agronomic traits observed during the preliminary trial

ACCESSION	ORIGIN	AGRONOMIC CHARACTERISTICS
CIP 84004.67	CIP, Peru	High yield, large tubers, moderately resistant to late blight, smooth tuber skin
CIP 380251.17	CIP, Peru	High yield, large tubers, resistant to late blight, smooth tuber skin, no greening of tubers
CIP 384558.10	CIP, Peru	High yield, large tubers
CIP 676070	CIP, Peru	High yield, large tuber, resistant to late blight, smooth tuber skin
Ganza	CIP, Peru	Large tubers, resistant to late blight, high survival
CIP 285411.22	CIP, Peru	High yield, large tubers, smooth skin, moderately resistant to late blight
BSU 5.19.2.1	Philippines	Moderate yield, resistant to late blight
CIP 573275	CIP, Peru	High yield, large tubers
CIP 676089	CIP, Peru	High yield, large tubers, resistant to late blight
BSU 5.19.2.2	Philippines	High yield, large tubers, resistant to late blight
Kennebec	USA	Large tubers, early maturing
CIP 575003	CIP, Peru	Smooth skin
CIP 13.1.1	CIP, Peru	High yield, large tubers
Catani	USA	Medium to large tubers
CIP 285378.27	CIP, Peru	High yield, large tubers

Land Preparation, Layout and Planting

In the production sites at Loo, Buguias, Balili, La Trinidad and Cabutotan, Bakun, trials were done in the open fields. However, in the farm at

Puguis, La Trinidad, a semi-open greenhouse was used. In all production sites, experiments were laid out using RCBD with three replications.

For easy evaluation, a uniform plot size (5m2) was used in open fields. Land preparation and application of compost were done in each farm.

Rooted stem cuttings from each potato accession were planted at a distance of 25 cm between hills and 30 cm between rows.

Cultural Management Practices

In all farms there was no application of synthetic fertilizers and pes-ticides. Crop diversity was practiced in all production sites to minimize pest occurrence. Botanical pesticides were used to control insects in some loca-tions.

Analysis of Data

Data per location were statistically analyzed using analysis of vari-ance (ANOVA) for RCBD. Data across locations were analyzed using Com-bined Analysis over Locations for RCBD. Comparison of treatment means were tested using the Least Significant Difference (LSD) at five percent level of probability.

RESULTS AND DISCUSSION

Preliminary evaluation of potato accessions for organic production

Late Blight Incidence

Late blight ratings were taken at 30, 45 and 60 days after plant-ing (DAP) as presented in Table 3. Accessions BSU 5.19.2.1, CIP 573275, CIP 676089, BSU 5.19.2.2 and Kennebec were highly resistant while CIP 84004.67, CIP 380251.17, Ganza, CIP 285378.27 were resistant to late blight at 60 DAP. Catani is the only accession which was moderately sus-ceptible. The rest of the accessions were moderately resistant.

Yield and Yield Parameters

Table 4 shows the yield per hill basis of the fifteen selected potato accessions. CIP 84004.67 and CIP 380251.17 had the highest marketable yield per plant with 153 g and 146 g, respectively. Yields of the different accessions were generally low. This could be attributed to the prevailing weather condition during the conduct of the study. During the trial, there was heavy rainfall which resulted to water logging.

Postharvest Characteristics

Dry matter and sugar content of the tubers were taken as shown in Table 5. Percent dry matter ranges from 11.50 (accession CIP 676089) to 28.88 (accession CIP 380251.17). Potato accession BSU 5.19.2.2 had the highest sugar content with 4.7 °Brix while potato accession BSU 5.19.2.1 had the lowest sugar content with 2.4 °Brix.

Table 3. Late blight rating of the selected potato accessions

ACCESSION	LATE BLIGHT RATING		
	30 DAP	45 DAP	60 DAP
CIP 84004.67	1	2	3
CIP 380251.17	1	2	3
CIP 384558.10	1	3	5
CIP 676070	2	3	4
Ganza	1	2	3
CIP 285411.22	2	3	4
BSU 5.19.2.1	1	1	1
CIP 573275	1	1	1
CIP 676089	1	1	1
BSU 5.19.2.2	1	1	1
Kennebec	1	1	1
CIP 575003	3	4	5
CIP 13.1.1	1	4	5
Catani	2	3	6
CIP 285378.27	1	3	3

Scale description: 1= highly resistant; 2-3= resistant; 4-5= moderately resistant; 6-7= moderately susceptible; 8-9= susceptible (Henfling, 1982)

Table 4. Marketable and total yield of the selected potato accessions

ACCESSION	YIELD (g/hill)	
	MARKETABLE	TOTAL
CIP 84004.67	153.00	175.67
CIP 380251.17	145.98	155.63
CIP 384558.10	89.74	99.88
CIP 676070	81.94	86.70
Ganza	57.54	66.79
CIP 285411.22	12.14	17.00
BSU 5.19.2.1	8.90	12.29
CIP 573275	78.60	79.95
CIP 676089	94.64	99.81
BSU 5.19.2.2	59.75	66.00
Kennebec	59.72	67.61
CIP 575003	15.63	20.52
CIP 13.1.1	19.21	26.83
Catani	123.33	129.17
CIP 285378.27	24.83	29.75
CV (%)	**25.33**	**23.24**
LSD (0.05)	**87.10**	**87.18**

Table 5. Dry matter content and sugar content of tubers of the selected potato accessions

ACCESSION	DRY MATTER CONTENT (%)	SUGAR CONTENT (°Brix)
CIP 84004.67	26.28	3.93
CIP 380251.17	17.78	2.07
CIP 384558.10	28.88	2.93
Ganza	23.23	2.67
BSU 5.19.2.1	14.00	2.40
CIP 573275	16.00	3.00
CIP 676089	11.50	3.10
BSU 5.19.2.2	14.50	4.70
Kennebec	19.50	3.70
CIP 575003	20.48	4.00
CIP 13.1.1	21.72	3.13
Catani	12.00	3.60
CIP 285378.27	23.47	3.50

Multilocation trials in representative production sites of the mid-mountain zone of Benguet

Balili, La Trinidad

The Production Site

The farm is located at the BSU Experimental Area, La Trinidad, Benguet and transitioned to organic production three years ago. It was previously planted with bush beans, potatoes and corn.

Agronomic Characters of Top Ten Potato Accessions

Canopy Cover. Table 6 shows the canopy cover of top ten potato accessions. No significant differences were observed at 30 and 60 DAP. However, Kennebec had the highest canopy cover at 30 DAP while accession CIP 575003 had the highest at 60 DAP. Meanwhile, accession CIP 380252.17 significantly had the highest canopy cover at 40 DAP.

It was also observed that the canopy cover decreased at 60 DAP due to the incidence of cutworm and late blight during this period. The canopy covers of accessions CIP 575003 and CIP 13.1.1, however, increased at 60 DAP which might be an indication of resistance to late blight.

Late Blight Incidence. Table 7 shows the late blight rating of the different accessions. It was observed that all the accessions were high-ly resistant at 30 DAP. However, at 40 DAP, Kennebec, Ganza and CIP 380252.17 were rated as moderately resistant while the rest of the accessions were still resistant to late blight. Incidence increased at 60 DAP for all the accessions except for accession BSU 5.19.2.2, which remained resistant to late blight.

The sudden increase in late blight infection at 60 DAP among the accessions could be due to the high relative humidity and sudden rain showers that occurred in the locality during the growing period of the plants.

Furthermore, the resistance among the accessions could be due to variation in their genetic make-up.

Table 6. Canopy cover of top ten potato accessions at 30, 40 and 60 DAP

ACCESSION	CANOPY COVER		
	30 DAP	**40 DAP**	**60 DAP**
Ganza	19	24	20
Kennebec	25	31	20
CIP 84004.67	18	19	18
CIP 380252.17	24	32	23
CIP 676070	23	29	19
CIP 573275	21	21	16
CIP 676089	17	18	14
BSU 5.19.2.2	11	13	14
CIP 575003	15	19	24
CIP 13.1.1	21	23	20
CV (%)	**25.04**	**26.54**	**28.05**
LSD (0.05)	**8.48**	**10.55**	**12.83**

Table 7. Late blight incidence of top ten potato accessions at 30, 45 and 60 DAP

ACCESSION	LATE BLIGHT RATING		
	30 DAP	**40 DAP**	**60 DAP**
Ganza	1	4	4
Kennebec	1	5	8
CIP 84004.67	1	2	5
CIP 380252.17	1	4	6
CIP 676070	1	3	5
CIP 573275	1	3	4
CIP 676089	1	3	4
BSU 5.19.2.2	1	2	3
CIP 575003	1	3	4
CIP 13.1.1	1	2	4

Scale description: 1= highly resistant; 2-3= resistant; 4-5= moderately resistant; 6-7= moderately susceptible; 8-9= susceptible (Henfling, 1982)

Yield per Hill. No significant differences were observed among all the accessions (Table 8). However, accession CIP 13.1.1 produced the highest marketable and total yield per hill.

Kennebec produced the lowest total weight per plant but all tubers were marketable. The high marketable and total yield of accession CIP 13.1.1 maybe attributed to its resistance to blight and high vigor during the early growth stage of the plant.

Table 8. Marketable, total yield per hill and dry matter content of top ten potato accessions

ACCESSION	YIELD (g/hill)		DRY MATTER CONTENT (%)
	MARKETABLE	TOTAL	
Ganza	40.00	41.00	20.00
Kennebec	38.00	38.00	21.00
CIP 84004.67	39.00	40.00	19.00
CIP 380252.17	69.00	70.00	18.00
CIP 676070	67.00	67.00	21.00
CIP 573275	42.00	43.00	21.00
CIP 676089	51.00	52.00	23.00
BSU 5.19.2.2	43.00	43.00	20.00
CIP 575003	46.00	46.00	22.00
CIP 13.1.1	80.00	81.00	20.00
CV (%)	**25.77**	**23.31**	**4.84**
LSD (5%)	**29.09**	**29.05**	**1.48**

Dry Matter Content of Tubers. Highly significant differences among the accessions were observed in terms of the percent dry matter con-tent of tubers (Table 8). Accession CIP 676089 had the highest dry matter content of tubers while accession CIP 380252.17 had the least dry matter content.

The ideal dry matter content of tubers for processing is 19% and above (NPRCRTC, no date), thus most of the accessions except CIP 380252.17 might be ideal for processing. Accessions CIP 676089 and CIP 575003, which had the highest dry matter of tubers, might be ideal for frying due to low oil absorption. The differences in the dry matter content of \tubers of the different accessions can be attributed to the varietal character-istics of each potato accession (Hesen, 1985).

Puguis, La Trinidad

The Production Site

The Master's Garden located at Sitio Pinalyok, Puguis, La Trinidad has an area of 1,500 m2 producing mainly vegetables. The topography is terraced and every terrace is constructed with a semi-open greenhouse.

The crops being planted are lettuces, zucchini, garden peas, bush beans, carrots, broccoli, cucumber, tomatoes, cabbage and sugar beets. Some herbs are also planted in small scale like marjoram, thyme, basil, rosemary, parsley, lemon balm, dill, sage, mint, chives, oregano and tarragon.

Agronomic Characters of Top Ten Potato Accessions

Late Blight Incidence. Late blight rating of the top ten potato accessions at 45, 60 and 75 DAP is shown in Table 9. At 45 DAP, all of the ac-cessions were highly resistant. At 60 DAP, accessions CIP 380251.17, BSU 5.19.2.1, BSU 5.19.2.2 and Kennebec were still resistant. At 75 DAP, CIP 84007.67, CIP 676070 and CIP 13.1.1 remained resistant while the other accessions were susceptible to late blight. The late blight infection maybe attributed to the high rainfall which directly affected the relative humidity. Pathologists reported high late blight infection when relative humidity is increased (Anonymous, 2006).

The resistance of the accessions could be due to the organic matter present in the medium which nourished the plants. This was confirmed by claims that soil organic matter feed soil biota with the practice of cover crops, compost and biologically-based soil amendments. This kind of prac-tice produces healthy plants that are able to resist disease and insect preda-tion (Anonymous, 2005).

Yield per Hill. Numerically, accession CIP 676089 and Ganza pro-duced the highest yield of marketable tubers while accession BSU 5.19.2.1 produced the lowest (Table 10). However, there were no significant differ-ences observed among the ten accessions.

Table 9. Late blight rating of top ten potato accessions at 45, 60 and 75 DAP

ACCESSION	LATE BLIGHT RATING		
	45 DAP	60 DAP	75 DAP
Kennebec	1	2	8
Ganza	1	1	6
CIP 84007.67	1	1	3
CIP 380251.17	1	3	7
CIP 676070	1	1	3
BSU 5.19.2.1	1	2	6
CIP 573275	1	1	5
CIP 676089	1	1	6
BSU 5.19.2.2	1	2	8
CIP 13.1.1	1	1	3

Scale description: 1 – Highly resistant; 2-3 – Resistant; 4-5 – Moderately resistant; 6-7 – Moderately susceptible; 8-9 – Susceptible.

Table 10. Marketable, total yield per hill and dry matter content of top ten potato accessions

ACCESSION	YIELD (g/hill)		DRY MATTER CONTENT (%)
	MARKETABLE	TOTAL	
Kennebec	47.14	52.57	23.00
Ganza	84.07	92.31	19.00
CIP 84007.67	47.69	56.09	19.00
CIP 380251.17	64.17	80.55	18.00
CIP 676070	37.80	43.99	21.00
BSU 5.19.2.1	23.50	29.17	20.00
CIP 573275	39.31	46.80	20.00
CIP 676089	82.50	114.83	24.00
BSU 5.19.2.2	45.18	50.59	20.00
CIP 13.1.1	50.41	65.00	19.00
CV (%)	**28.64**	**27.71**	**3.17**
LSD (5%)	**29.09**	**51.89**	**1.72**

Dry Matter Content (DMC) of Tubers. Highly significant differences for dry matter of tubers were noted among the ten accessions. Accession CIP 676089 obtained the highest tuber DMC, but not significantly different with Kennebec. Accession CIP 380251.17 had the lowest

DMC of tubers. DMC of tubers ranged from 18 to 24 %, an indication of good processing types of potatoes.

Loo, Buguias

The Production Site

The farm is located in the valley of Loo, Buguias near the foot of the mountains. It has a plastic house and open fields for organic farming where different varieties of lettuces are being grown.

Agronomic Characters of Top Ten Potato Accessions

Canopy Cover. Table 11 shows the canopy cover of the different potato accessions taken at 30 and 60 DAP. Wide canopies were observed in CIP 380251.17, BSU 5.19.2.2 and CIP 13.1.1 at 30 DAP while the lowest was found in CIP 84007.67 and BSU 5.19.2.1. Canopy cover was observed to have decreased for most accessions at 60 DAP due to the frost that oc-curred late in December which also predisposed the plants to late blight in-fection. However, for potato accession CIP 13.1.1 canopy cover has slightly increased at 60 DAP which can be attributed to its tolerance to the frost and late blight resistance.

Late Blight Incidence. Almost all accessions showed high resis-tance at 45 DAP except for Kennebec which was resistant. At 60 DAP, accessions CIP 84007.67, Kennebec and CIP 380251.17 succumbed to late blight infection (Table 12) while accessions CIP 676070, BSU 5.19.2.1 and CIP 575003 were moderately susceptible. The potato accessions that showed resistance at 60 DAP were accessions CIP 573275 and CIP 676089 while moderately resistant accessions were BSU 5.19.2.2 and CIP 13.1.1. The sudden rains that came during the duration of the trial may have con-tributed to the late blight infection. The frost that occurred in late December may have also contributed to further infection.

Yield and Dry Matter Content. Among the accessions, CIP 13.1.1 produced the highest marketable and total yield per hill followed by CIP 676089 (Table 13). The yield of all accessions was affected by the early death of most plants due to frost.

Dry matter content of tubers ranged from 17 to 22 %. Most of the potato accessions fall within a range ideal for processing (> 19%).

Table 11. Canopy cover of top ten potato accessions at 30 and 60 days after planting

ACCESSION	CANOPY COVER	
	30 DAP	60 DAP
Kennebec	15	0
CIP 84007.67	5	0
CIP 380251.17	25	3
CIP 676070	13	6
BSU 5.19.2.1	7	1
CIP 573275	20	15
CIP 676089	19	10
BSU 5.19.2.2	25	8
CIP 575003	18	2
CIP 13.1.1	23	26
CV (%)	**27.91**	**60.31**
LSD (0.05)	**8.33**	**17.17**

Table 12. Late blight incidence of ten potato accessions at 45 and 60 DAP

ACCESSION	LATE BLIGHT RATING	
	45 DAP	60 DAP
Kennebec	2	9
CIP 84007.67	1	9
CIP 380251.17	1	8
CIP 676070	1	6
BSU 5.19.2.1	1	7
CIP 573275	1	3
CIP 676089	1	3
BSU 5.19.2.2	1	4
CIP 575003	1	7
CIP 13.1.1	1	4
CV (%)	**32.17**	**30.76**
LSD (0.05)	**0.67**	**3.66**

Scale description: 1–Highly resistant; 2-3–Resistant; 4-5–Moderately resistance; 6-7–Moderately susceptible, 8-9–Susceptible

Table 13. Marketable, non-marketable, total yield and dry matter content of tubers of top ten potato accessions

ACCESSION	YIELD (g/hill) MARKETABLE	TOTAL	DRY MATTER CONTENT (%)
Kennebec	19.00	24.00	19.00
CIP 84007.67	28.00	29.00	19.00
CIP 380251.17	33.00	43.00	17.00
CIP 676070	33.00	34.00	18.00
BSU 5.19.2.1	26.00	27.00	22.00
CIP 573275	41.00	42.00	21.00
CIP 676089	49.00	51.00	19.00
BSU 5.19.2.2	39.00	40.00	20.00
CIP 575003	14.00	28.00	19.00
CIP 13.1.1	76.00	87.00	21.00
CV (%)	**67.98**	**80.22**	**2.28**
LSD (5%)	**32.27**	**45.69**	**0.67**

Cabutotan, Bakun

The Production Site

The transitional organic farm is situated on the boundary mountains of Bakun and Kibungan. The farm has an area of one hectare and was con-verted to organic in 2004. Various crops are grown such as broccoli, Chi-nese cabbage, sweet potatoes, and others.

Agronomic Characters of Top Ten Potato Accessions

Canopy Cover. The highest canopy cover was found in potato accession CIP 13.1.1 at all dates as shown in Table 14. Potato accessions which had wide canopies at 60 DAP were CIP 13.1.1, BSU 5.19.2.2, CIP 676089, and CIP 676070. The rest of the 676070, BSU 5.19.2.1 and CIP 575003 were moderately susceptible. The potato accessions that showed resistance at 60 DAP were accessions CIP 573275 and CIP 676089 while moderately resistant accessions were BSU 5.19.2.2 and CIP 13.1.1. The sudden rains that came during the duration of the trial may have contributed to the late blight infection. The frost that occurred in late December may have also contributed to further infection.

Table 14. Canopy cover of top ten potato accessions at 45 and 60 DAP

ACCESSION	CANOPY COVER	
	45 DAP	60 DAP
Ganza	9	17
CIP 380251.17	11	17
CIP 384558.10	7	12
CIP 676070	10	21
CIP 285411.22	6	7
CIP 573275	5	7
CIP 676089	12	22
BSU 5.19.2.2	13	23
CIP 13.1.1	13	26
CIP 285378.27	7	9
CV (%)	**37.18**	**43.30**
LSD (5%)	**4.89**	**8.40**

Late blight incidence. Accessions CIP 380251.17 and BSU 5.19.2.2 maintained high resistance until harvest. The other accessions such as CIP 384558.10, CIP 676070, CIP 573275, CIP 676089 and CIP 13.1.1 were re-sistant while Ganza was moderately resistant. Accession CIP 285378.27 was moderately susceptible while CIP 285411.22 was susceptible at 75 DAP (Table 15).

Table 15. Late blight ratings of top ten potato accessions in at 45, 60 and 75 DAP

ACCESSION	LATE BLIGHT RATING		
	45 DAP	60 DAP	75 DAP
Ganza	1	1	4
CIP 380251.17	1	1	1
CIP 384558.10	1	1	3
CIP 676070	1	1	3
CIP 285411.22	1	4	8
CIP 573275	1	1	3
CIP 676089	1	1	3
BSU 5.19.2.2	1	1	1
CIP 13.1.1	1	1	2
CIP 285378.27	1	2	7
CV (%)	**0.00**	**52.69**	**41.70**
LSD (5%)	**0.00**	**1.98**	**3.30**

Yield and Dry Matter Content. Potato accession CIP 13.1.1 produced the highest marketable and total yield per hill while CIP 573275 pro-duced the lowest (Table 16).

Dry matter was found to be highest in CIP 676089. High dry matter content of tubers is good for processing into chips and fries.

Table 16. Marketable, non-marketable, total yield per hill and dry matter content of tubers of top ten potato accessions

ACCESSION	YIELD (g/hill)		DRY MATTER CONTENT (%)
	MARKETABLE	TOTAL	
Ganza	40.28	43.56	17.00
CIP 380251.17	68.55	72.05	18.00
CIP 384558.10	52.77	57.25	17.00
CIP 676070	40.94	44.19	17.00
CIP 285411.22	32.46	37.02	19.00
CIP 573275	23.45	27.74	20.00
CIP 676089	46.25	48.50	21.00
BSU 5.19.2.2	63.65	68.97	20.00
CIP 13.1.1	102.68	113.11	19.00
CIP 285378.27	33.19	35.89	19.00
CV (%)	**48.59**	**43.75**	**3.87**
LSD (5%)	**30.40**	**30.70**	**1.26**

Yield Performance of the Potato Accessions across Production Sites

Table 17 shows the total yield per hill of the top ten potato accessions across locations. Among the ten accessions CIP 13.1.1 out yielded the other accessions in almost all locations. CIP 575003 had the lowest yield per hill.

The high yield of CIP 13.1.1 might be attributed to its resistance to blight and high vigor during the early growth stage of the plant. It was also observed that accessions with high yield had wide canopy cover. The low yield of Kennebec, on the other hand, might be due to early infection or susceptibility to late blight.

Potato accessions grown in Puguis gained the highest yield per hill which might indicate favorable conditions for potato production. Yields are often a reflection of soil, weather, and management in a farm (Dahnke, 1993). Thus, management of the farmer and environmental conditions in the farm might be favorable for potato production.

Adverse environmental conditions such as heavy rains and frost were encountered during the trials in Balili and Puguis, La Trinidad, Loo, Buguias and Cabutotan, Bakun. These factors may have contributed to high late blight infection and eventually low yield.

Table 17. Total yield (g/hill) of top ten potato accessions across production sites

ACCESSION	BALILI	PUGUIS	LOO	CABUTOTAN	MEAN
Kennebec	38.11	52.57	24.33	18.17	33.30
Ganza	40.46	92.31	24.14	44.19	50.28
CIP 84004.67	40.02	56.09	29.36	19.42	36.22
CIP 380251.17	69.50	80.56	42.59	72.05	66.18
CIP 676070	67.47	43.99	33.76	57.25	50.62
CIP 573275	43.00	46.81	42.13	43.56	43.88
CIP 676089	52.14	114.83	51.00	48.5	66.62
BSU 5.19.2.2	42.86	50.89	39.88	68.97	50.65
CIP 575003	46.44	32.57	27.57	25.91	33.12
CIP 13.1.1	81.20	65.00	87.20	113.11	86.63
Mean	**52.12**	**63.56**	**40.20**	**51.11**	**51.96**
CV (%)	**23.31**	**27.71**	**27.00**	**29.38**	
LSD (5%)	**29.05**	**51.89**	**45.67**	**11.41**	

CONCLUSION

The best accession in terms of yield and resistance to late blight in all locations is accession CIP 13.1.1. Other accessions with good performance based on yield and resistance to late blight are accessions CIP 676089, BSU 5.19.2.2, CIP 380251.17 and CIP 676070. Agronomic characters such as yield, resistance to late blight and canopy cover may be the primary basis for selection of accessions adapted under organic production.

High rainfall and relative humidity predisposed the potato plants to late blight infection which may eventually result in low yield.

Sustainable potato production can be achieved through organic tech-nologies including the use of potential potato varieties.

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