

Evaluation and Selection of Newly Released Potato Varieties (*Solanum tuberosum*) at West Hararghe Zone East Ethiopia

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Abstract

The study was conducted at Oda bultum and Mechara on station in 2013 - 2014 cropping season to identified diseases resistance, high yielding and disease/ insect pest resistant /tolerant potato varieties to the studied area, Four Irish potato varieties, Gudanne (standard check), Bubu, Toluma and Bete were used as a material. The trial was laid out RCB design with three replication the tuber was sown at spacing of 75cm x 30cm between rows and plants respectively from analyzed result showed that Bubu and Gudane varieties were the highest mean of plant height 83.9cm followed by 83.5cm respectively, at marketable yield, differed significance found among varieties $p \leq 0.05$ and 32.1 tone/ha and 27.3ton ha⁻¹ found at Gudane followed by Bubu variety respectively. Toluma and Gudane varieties were the highest mean of unmarketable yield at 3.0 ton ha⁻¹ and 0.1986 ton/ha⁻¹ respectively. on disease reaction, Toluma was the highest susceptible to disease, At total yield significance difference found among varieties and Gudane and Bubu varieties were the highest mean of total yield with 34.0ton ha⁻¹ and 30.05ton ha⁻¹ respectively. in generally Gudane was continued as seed material for the area.

Keywords: Irish potato, *solanum tuberosum* L, marketable yield, disease, varieties.

1. INTRODUCTION

Potato (*Solanum tuberosum* L.) is one of the most important food crops developed as well as developing countries. Among the world's food crops it ranks in the top five in tonnage, and as a source of food energy. It provides about one sixth as many calories as since, wheat and maize. It is one of the most widely grown root and tuber crops and stands second next to inset in area of coverage. It is very important food and cash crop in our country especially when the grain depleted from the store and contributes to food security (Girma, 2004). It is also efficient in converting resources such as labium and capital in to a high-energy food. Its efficiency of protein production is higher than commonly sliced. If carefully managed it gives the highest yield of nourishment per hectare of all basic foodstuff in tropical and subtropical countries. Furthermore the growing period is only 90-125 days enabling multiple cropping for optimum use of the available land and moisture? It is noted that in potato producing areas double cropping is possible (Solomon, 1985).

Among several root and tuber crops, potato plays significant dietary role for human beings provided that good quality and high yield is guaranteed. It is not by chance that precisely the potato has to come to play on important port in more and better food supply. This tuber is so structural that it is supplier not only carbohydrate for body heat and work out put, but also high quality protein that the body can easily absorb. In addition to a number of minerals and nutrient salt the potato contain several vitamins from group B and large amount of the vital vitamin C (Solomon, 1985).

Now a day besides its consumption potato is an excellent cash crop. However potato varieties available at hand of formers in the major years and susceptible to disease particularly late blight (Rice *et al.*, 1990). Hence lack of high yielding adaptable potato varieties which are tolerant, resistant to major disease and insect pest is becoming a major problem. To address this problem of farmer, developing environmentally friendly adaptable high yielding and disease tolerant varieties is a priority concern. So this research program is initiated to study the adaptability of potato varieties in western Hararghe to increase the production and productivity and there by contributing to food security.

Based on CSA report of 1993/94 the national average yield of sweet potato was 7 tons per hectare. However, under research condition root yield using improved varieties and available technology ranges from 30-50 tons per hectare (Chipugu, 2000). There are number of biophysical and socio-economic constraints that hinder the productivity of Potato under farmers' circumstances at Mechara. Among others, lack of high yielding and acceptable quality, and pest resistance/tolerant varieties has been the limiting factors. So these constraints are effect productivities of crops, So to evaluate and identify adaptable, high yielding and disease/ insect pest resistant /tolerant potato varieties for Daro Labu, Oda bultum and similar agro-ecologies.

2. MATERIALS AND METHODS

2.1. Description of the study area

An experiment was conducted at two location, Mechara research on station and Oda bultum Farmer training

Center(FTC), in 2012 - 2013. It is located 434 km to the east of Addis Ababa in Daro Labu District of West Hararghe Zone in Oromia Regional State. It is 115 km from Cirow town (Zonal Capital) Its latitudinal and longitudinal positions are 40°19.114' N and 80°35. E respectively

Mechara research center is located in moist mid altitude (Weyna-dega) agro-ecology and its altitude is 1760 m.a.s.l with annual average temperature and rainfall 16°C and 963 mm respectively. The major soil type of the center is sandy loam clay which is reddish in color.

Oda bultum is one of the districts found in west Hararghe zone. It is located 362 km to the east of Addis Ababa, it is located at 80°54, 31'80N, 40°21E. Its Altitudinal range is from 1040 - 2500 m.a.s.l), the average altitude of the district is 1770 m.a.s. The annual rain fall is 900 mm-1100 mm). It has a mean maximum and mean minimum temperature of 28°C and 25°C; respectively. The maximum rainfall and minimum rainfall is 1200mm and 900 mm (DOA, 2012)

2.2. Planting Seed and treatment design arrangement

Three released Irish Potato varieties were brought from Haromaya University, Bubu, Bete and Toluma and one as a standard check Gudane from local. the field experiment was laid out with RCB design with three replication. The seed was sown at 70cm x 30cm between row and plant and 10 cm of depth in furrow, respectively and the plot size was 3m x 3m area. Application of fertilizer was as per national recommended rates, 100 kg of Urea ha⁻¹ and 200 kg ha⁻¹ of Dap and other Agronomic practice were applied to all plots.

2.3. Data analysis

Data on different growth and yield were be subjected to the Analysis of Variance (ANOVA) by using SAS version 9.2. (SAS Institute Inc., 2008). Significant treatment means were separated using LSD (Least Significance Difference).

3. RESULTS AND DISCUSSION

3.1. Plant height

Plant height, first and second year analysis result revealed that, significance difference among varieties was found, but Gudane variety was the maximum means of plant height at two years with 77.4 cm and 89.5 cm, respectively(table, 1 and 2). Tuluma variety was the least mean of plant height with 54.1cm. At second year, none significance difference among varieties, but Bubu variety was the highest mean with 93.1cm. in generally, the he combined analysis result over year result revealed that, Bubu varieties was the highest mean of plant height(table 3).

3.2. 50% Flowering date

At 50% flowering, The combined analysis of over year result showed that significance differed among varieties, Toluma varieties was the least mean of 46.3 day followed by Bete, 49.1 days. Gudane (standard check) was the late flowering date(50.4) followed by Bubu 50 day, respectively.

3.3.Canopy diameter

Canopy diameter,. Combined analysis of variance result revealed that significance difference found among varieties, Bubu was the highest mean of 51.1cm followed by Bete, 49.6cm respectively. Toluma variety was the lowest mean of 45.4cm.(table. 3).

3.4.Average number of main brunch

In table 3. analysis result indicated that at average number of main brunch, there was significance difference found among varieties, but Bubu was the maximum of average number of main brunch with 6.3 followed by Bete 4.6. Toluma was the lowest mean Average number of main brunch, 3.3.

Table 1. The Mean combined analysis of Agronomy and growth traits in first years at two location, Oda bultum and Mechara on station in, 2013.

Varieties	PH(cm)	50% DF	CnD(cm)	NoMB	MD	AvnoT/P	MY(t/ha)	UnMy t/ha	TY t/ha	DR
Gudane	77.4a	55ab	55.5a	2.3a	100.3	21a	38.7a	0.27d	38.97a	1.0c
Bubu	74.6a	57a	56a	2a	99.6	20a	30b	0.3c	30.3b	1.0c
Bete	61.0a	53.6b	52.3b	2.3a	93.3	11.4b	20.3c	1.1a	21.4c	2.6b
Toluma	54.1b	50c	45.9c	2a	97.7	12.2b	17.5c	0.4b	17.9d	4.0a
Mean	66.8	53	52.4	2.1	97.7	53	26.7	0.5	27.2	2.16
CV %	16.3	1.9	2.6	15.3	3.3	1.9	5.3	1	5.5	13.3
LSD	21.7	2.07	2.7	0.6	6.4	2.07	2.8	0.022	2.9	0.5
Pv	*	*	*	Ns	*	*	Ns	Ns	Ns	Ns

NS and *: non significant at $P > 0.05$, significant at $P \leq 0.05$, respectively, ** = highly significant, *= Significant, Means with the same treatment and column sharing the same letters are not significantly different at $P < 0.05$

Table 2. The Mean combined analysis of Agronomy and growth traits for second years at two location Oda bultum and Mechara on station in, 2014

Varieties	PH(cm)	50%FD	CD(cm)	NoMnBr	AvnoT/p	MD	Myt/ha	Unmt/ha	TYt/ha	Dr
Gudane	89.6	45.3ab	52.0a	5.3a	98.3	17.0ab	25.3	3.7	29.12a	1.0c
Bubu	93.2	46.6b	56.1a	6.0a	96.6	9c	24.1	5.7	29.8a	1.0c
Bete	84.1	45.3ab	45.0b	6.9a	91.3	18.4a	17.5	2.0	19.5b	3.0b
Toluma	85.7	43.0b	45.0b	4.6a	90.7	13 ^{bc}	17.3	0.4	17.7bc	4.0a
Mean	61.1	45.0	49.5	5.7	97.7	16.2	21.1	4.7	25.8	2.25
CV	14.3	3.48	4.8	25.1	3.3	23.3	12.3	13.7	14.7	22.22
LSD	23.3	3.14	4.8	2.9	6.4	7.5	5.2	0.4	6.2	0.99

NS and *: non significant at $P > 0.05$, significant at $P \leq 0.05$, respectively, ** = highly significant, *= Significant, Means with the same treatment and column sharing the same letters are not significantly different at $P < 0.05$

Table 3. The mean combined analysis of two years result on growth and Agronomy component for adaptation trial of Potato at Habro and Oda bultum in, 2013- 2014.

Varieties	PH(cm)	50FD	CD(cm)	NoMnBr	AvnoT/p	MD	My(t/ha)	Unmt/ha	Tyt/ha	Dr
Gudane	83.5a	50.4a	47.3a	6.3a	18.55a	99.3a	32.03a	1.98b	34.05a	2.3b
Bubu	83.9a	50.0a	51.1a	4.4b	14.17a	98.1a	27.05b	3a	30.05b	2.2b
Bete	72.5a	49.1a	48.6a	4.6b	14.7a	92.3a	18.9c	1.55c	20.40c	2.8a
Toluma	69.9a	46.5b	45.4b	3.3c	12.8b	94.2a	17.4cd	0.4d	17.8cd	4.0a
Mean	77.4	47.74	48.1	4.6	34.6	97.7	23.9	2.6	24.5	2.83
CV %	14.7	1.60	4.98	9.3	12.6	3.3	5.2	7.1	6	22.4
LSD	22.5	1.52	4.7	0.82	4.785	6.4	2.5	0.24	2.9	1.26

NS and *: non significant difference at $P > 0.05$, significant difference at $P \leq 0.05$, respectively, ** = highly significant, *= Significant, Means with the same treatment and column sharing the same letters are not significantly different at $P > 0.05$

3.4.Average number of tuber per plant

At an average number of tuber per plant, analysis of over year result indicated that non significance difference among varieties. however, Gudane was the highest mean of average number of tuber per plant 18.55 followed by Bete 14.7, respectively. and Toluma was the lowest mean with 12.

3.5.Maturity date

The maturity date, combined analysis result showed that there was no significance difference among varieties, but Toluma variety was early matured variety 94 day (in table 3). and Gudane variety was late maturity date compared to other varieties with 99.3 day.

3.6.Marketable yield

From two years analysis of result significance difference found on marketable yield, but Gudane variety was the maximum marketable yield with 32.03 ton ha⁻¹, followed by Bubu variety (27.05 ton ha⁻¹ at). The lowest mean of marketable yield recorded by Toluma 17.4ton ha⁻¹.

3.7.Unmarketable yield

In first year and second, there was significance difference among the varieties on unmarketable yield. The highest mean of unmarketable yield was recorded by Bubu 3ton ha⁻¹ followed by 1.985ton ha⁻¹ on Gudane. The lowest mean of unmarketable yield was recorded by Bete varieties 0.4 ton ha⁻¹.

3.8.Total yield

From combined two year of analyzed result showed that significance difference found among the varieties and Gudane variety was the highest mean of total yield by 34.03 ton ha⁻¹ followed by 30.05 ton ha⁻¹ followed Bubu in table 3. Bete and Toluma was the lowest mean of total yield by 20.4ton ha⁻¹ and 17.8ton ha⁻¹ respectively.

3.9.Disease reaction

From result showed that significance difference of among varieties, but Toluma susceptible to late blight, where as Bubu and Gudane varieties were resistance to the disease.

4.Conclusion and Recommendation

From two year analysis result revealed that, Gudane variety was the good performance on yield and growth components as well as moderate disease resistance when compared to other newly released varieties, So as standard check (Gudane) variety was continued used as seed material to the mid altitude of Daro labu and Oda bultum and similar agro ecology area.

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