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Adaptability Study of Improved Irish Potato *(Solanum tuberosum L.)* Varieties at South Ari Woreda, Ethiopia

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Abstract

Three improved Irish potato varieties and one local check were evaluated with the objective of selecting adaptable best performing Irish potato varieties and tolerant to late blight for Irish potato production areas of South Omo zone. The trial was conducted at Senmamer kebele of Debub Ari district, Ethiopia during 2013 cropping seasons using randomized complete block design under rain faid condition. Tuber yield, plant height, number of stem, crop reaction to late blight, average number of tuber per plant, average weight of tuber per plant, average tuber diameter, small size tuber, medium size tuber and large size tuber ranged from 2.5 to 12.6, 30.3 to 58.9, 2.2 to 4.5, 5 to 47.8, 8.2 to 10.7, 0.14 to 0.78, 8.1 to 11.2, 0.04 to 0.2, 0.04 to 0.3, 0.05 to 0.3, respectively .This experiment suggests that the variety Belete was gave high yield and resistant to late blight compare to the other tested varieties.

Keywords: Improved Irish potato varieties; adaptability; tuber yield

1. Introduction

Potato (*Solanum tuberosum L.*) is an important food source in the world. The tuber is known to supply carbohydrate, high quality protein, and substantial amounts of essentials vitamins, minerals, and important elements [4]. Like many other countries in the world, potato is a very important food and cash crop especially on the highland and mid altitude areas of Ethiopia [1].

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Potato provides food and income as a cash crop for over 2.3 million households in different part of Ethiopia (Central Agricultural Census Commission, 2003). In recent years, potato production has dramatically increased by about 64%, from 349,000 t in 1993 to 572,332 t in 2010 [8]. Potatoes are mostly consumed after boiling and are incorporated as an Ingredient [7].

Nevertheless, there is an increasing demand for potato as an ingredient in other fast foods that entail salad and processed products such as French fries and crisps, as a result of dietary diversification among urban dwellers, emerging fast food restaurants and roadside small-scale fryers [7].

In south Ari woreda of South Omo zone, Irish potato is considered as a household food security crop. The crop is primarily grown for home consumption, although in some areas of south omo zone, the crop has gained commercial value and it is produced for cash. Most of Irish potatoes grown by the farmers in South Omo zone are low yielders due to many factors. These include diseases and pests, and lack of high yielder varieties. Late blight, caused by the oomycete *P. infestans,* is a major disease of potato worldwide [3].

Yield losses due to the disease are attributed to both premature death of foliage and diseased tubers. In South Omo zone, the disease occurs throughout the major potato production areas .To control this disease farmers must use resistance variety. Therefore, the objective of this study is to evaluate performance and adaptability of improved varieties of Irish potato and to select resistant variety to late blight.

2. Materials and Methods

The experiment was conducted at south Ari woreda of Senmamer kebele of South Omo zone which is 10 km away from Jinka town. The sites are situated at 653432N and 231980E with an altitude of 2100 m.a.s.l. This area receives a mean annual rainfall of 1000 mm with maximum and minimum temperatures of 35^{o}c and15^{o}c, respectively.

Three improved Irish potato varieties and one local check were planted at recommended seeding rate of 25 kg/ha on March 2, 2013. A randomized complete block design with three replications was used. Each plot consisted of four rows, 3 m long and width with spacing of 75cm between rows and 30cm between plants.

The sprouted and healthy potato seed tuber of each varieties were sown in having a depth of 15cm. Fertilizer was applied with the rate of 165kg/ha of UREA and 195kg/ha of DAP. The half dose of urea and full dose of DAP was applied at planting time and the remaining half dose of urea was equally side dressed during flowering time. Weeding and other recommended management practices were carried out as per the requirement of the crop. At physiological maturity five random plants within each plot were manually uprooted to determine plant height, number of stem per branch, crop reaction to blight diseases, number of tuber per plant, weight of tuber and tuber diameter. Grain yield was determined after harvesting the two middle rows. The data were analyzed using SAS [9].

3. Results

Results of analysis of variance of 10 characters for 3 improved Irish potato and one local check of the respective location are presented **in (Table 1)** Plant height, average tuber diameter, small size tuber, medium size tuber and large size tuber showed significant ($p<0.05$) but average tuber weight and tuber yield showed significant ($P<0.01$) difference among the tested varieties. The other characters, number of stem, crop reaction to blight disease, average number of tuber per plant showed non-significant variation among the tested varieties.

The presences of significance differences among varieties indicate the presence of genetic variability for each of the characters among the tested varieties and local check.

Tuber yield (kg/plot) ranged from 2.5 to 12.6 for local check and Belete, respectively. Plant height, number of stem per plant, average number of tuber per plant, average weight of tuber, average tuber diameter, small size tuber, medium size tuber, large size tuber and crop reaction to blight disease varied from 30.3cm to 58.9cm, 2.2 to 4.5, 8.7 to 10.7, 0.14 to 0.78, 7.0 to 11.2, 0.04 to 0.2, 0.04 to 0.3, 0.05 to 0.3 and 5.0 to 47.8, respectively.

4. Discussion

According to [2] and [6] potato yield loss attributed primarily to late blight is dependent on variety susceptibility or tolerance / resistant and disease management practices. It was, therefore, necessary to select a variety which can give high tuber yield and resistant to late blight. For commercial production of Irish potato, Kankwatsa *et al.* (2002) suggested that use of resistant varieties reduced the late blight severity by more than 50% and resulted in yield gains of more than 30%, in the present study the variety Belete gave high tuber yield and tolerant to late blight.

5. Conclusion

In South Ari woreda of South omo zone the variety Belete gave high yield and resistant to late blight, and it was preferred by farmers during field day for its high yield, big tuber size and disease resistant capability at each location. Therefore, dissemination of this variety to the farmer is vital to increase production and productivity of Irish potato in the areas.

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Table1: Significances of mean square values for 10 agronomic traits for 3 improved Irish potato varieties and one local check.

Source of variation	Df	Ph (cm)	Ns	CRXN	ANT	AWT	ATD	SST	MST	LST	T Y
Replication	2	142.4*	0.5ns	445.1 ns	14.6^{ns}	0.1ns	0.2ns	0.008ns	0.006ns	0.01ns	14.8ns
Treatment	3	419.6^{ns}	3.2ns	1087.1ns	0.2**	0.2***	9.7 *	0.02*	0.03*	0.05*	70.06**
Error	6	47.0	0.09	251.1	6.0	0.02	2.2	0.003	0.004	0.007	7.1
Cv(%)		15.4	26.2	56.4	23.0	29.6	16.0	48.8	43.3	40.2	31.1

*, **, *** Significant at p<0.05, P<0.01,P<0.001 a LSD= Least significance difference(P<0.05), PH= Plant height in cm, NS= number of steam, CRXN =crop reaction to crop diseases, ANT= average number of tuber per plant, AWT= average weight of tuber, ATD= average tuber diameter , SST= number of small size tuber per plant, MST=number of medium size tuber per plant, LST=number of large size tuber and TY= tuber yield(Kg/plot)

Table2: Mean value of plant height, number of stem, crop reaction to late blight, average number of tuber per plant, average weight tuber, and average tuber diameter, number of small size tuber per plant, number of large size tuber, medium size tuber and tuber yield.

Treatment	PH	NS	CRXN	ANT	AWT	ATD	SST	MST	LST	TY
Belete	58.9	3.7	5.0	10.1	0.7	11.2	0.2	0.2	0.3	12.6
Jalene	46.8	4.5	21.0	13.5	0.74	8.7	0.19	0.3	0.29	12.3
Gudene	42.4	4.2	47.8	8.2	0.78	8.1	0.06	0.1	0.19	6.9
Local check	30.3	2.2	38.7	10.7	0.14	7.0	0.04	0.04	0.05	2.5
LSD	13.7	1.9	31.7	4.9	0.3	2.9	0.11	0.13	0.17	5.3

LSD= Least significance difference (P<0.05), PH= Plant height in cm, NS= number of steam, CRXN =crop reaction to crop diseases, ANT= average number of tuber per plant, AWT= average weight of tuber, ATD= average tuber diameter, SST= number of small size tuber per plant, MST=number of medium size tuber per plant, LST=number of large size tuber and TY= tuber yield (Kg/plot).

References

[1] Borgal, H.B., Arend, C., Jacobi, Kanyarukis, S., Kulazia, A., Lemaga, B.L., Mogaeka, and prante,W.*Production,marketingand consumption of potato in the Ethiopia highlands'* (Holleta, Hawassa, and Alemaya) Center of Advanced training in agricultural development technology, University of Berlin, 1980.

[2] Bradshaw, N.J. *The use of fungicides for control of potato late blight* (*Phytophthora infestans*). *Aspects of Applied Biology*, 1992, 33: 101-106.

[3] Hijmans, R.J., Forbes, G.A., and Walker, T.S. 2000. *Estimating the global severity of potato late blight with GIS linked disease forecast models. Plant Pathology* 49: 697–705.

[4] Horton, D., and Sawyer, RL. *The potato as a world food crop, with special reference to developing areas. potato physiology*. London, Academic, In Li PH, ed 1985, Press 1-34.

[5] Kankwatsa, P., Adipala, E., Hakiza, J.J., Olanya, M., Kidanemariam, *Effect of integrating planting time, fungicide application and host resistance on potato late blight development in South-western Uganda. Journal of Phytopathology*, H.M.. 2002,150: 248–257.

[6] Thind, T.S., Chander-Mohan, J.S., Bedi, R.K., Grewal and Sokhi, *Role of application time of fungicides in the control of late blight of potato. Plant Disease Research*, S.S. 19894(2): 113- 117.

[7] Tesfaye A., B. Lemaga, J.A. Mwakasendo, Z. Nzohabonayoz, J. Mutware, K.Y. Wanda, P. M. Kinyae, O. Ortiz, C. Crissman and G. Thiele.. *Markets for Fresh and Frozen Potato Chips in the ASARECA Region and the Potential for Regional Trade: Ethiopia, Tanzania, Rwanda, Kenya, Burundi and Uganda. Working Paper*. International Potato Center (CIP). Lima, Peru. 2010, 44 pp.

[8] Food and agricultural organization (FAO).*Production year book*, Rome., Italy. 2011, 197pp.

[9] SAS Institute INC.*SAS statistical analysis software* (SAS).Cary,NC, ASA,2009.