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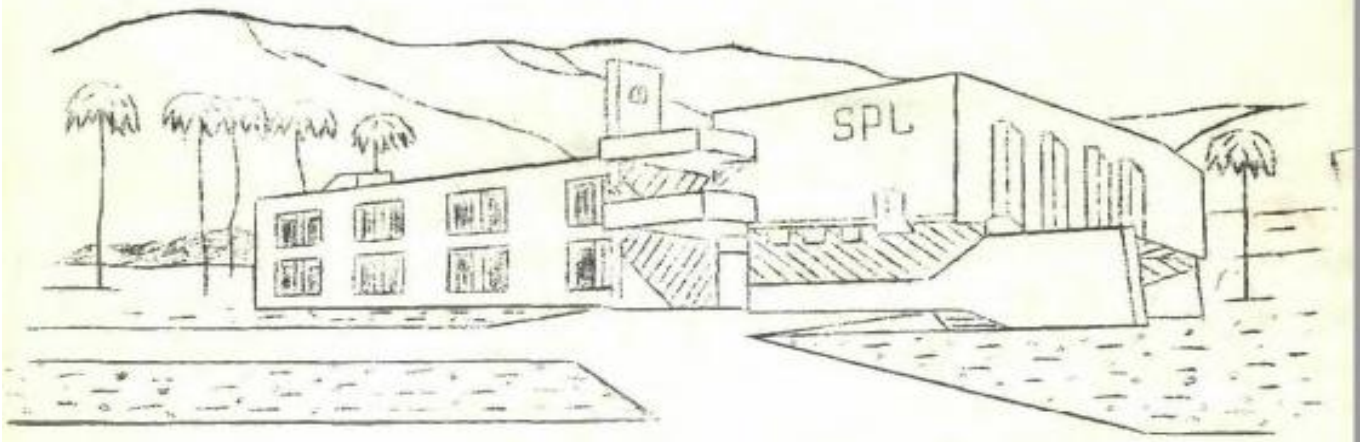

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AMBO–ETHIOPIA

PAPER PRESENTED AT INTERNATIONAL CONGRESS OF THE
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OBTAINING AND RAPID MULTIPLICATION OF DISEASE-FREE POTATO SEED TUBERS IN ETHIOPIA [1]

BY

V.A. Knyazev [2]

Potato is a valuable food crop and can grow in different climatic conditions. Conditions of Ethiopian high lands fully respond to the demand of the potato plant where around 30 thousand hectares are grown. The most common varieties were introduced from abroad during 1940, and lost their quality due to low yield and high susceptibility to potato late blight.

Nowadays potato production is hindered due to absence of seed of varieties which give a high yield and are resistant to late blight. It is true that trials of hybrids in the International Potato Center are conducted over a number of years with the objective of evaluating yield and resistance to late blight. Dr. Haile Michael from Alemaya college is carrying out the trial in defferent agro-climatical conditions of Ethiopia. Many clones with different qualities were identified by them. However the potato samples were infected by virus and bacterial diseases during the trial. For initial seed production work of new varieties firstly it is very essential to eradicate virus infection.

The most prevalent viruses are X,S,M virus. Starting from 1980 eradication or virus infection from promising varieties using methods of meristem culture and rapid multiplication of disease-free potato is carried out in the Scientific Phytopathological Laboratory Ambo.

Materials and methods

Three varieties were taken for eradication of virus infection: A1-204; A1-253; A1-563 which have X, S, M virus and bacterial

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2. Phytopathologist, Scientific Phytopathological Laboratory P.O. BOX 37, Ambo.

wilt. Germinated tubers were subjected to a temperature 35-37° C for 4-7 weeks. After this from each sample, 24 to 33 meristem tips with a size of 0.15-0.30 mm will be excised in a sterile box. The nutrient media is composed of basal salts, major and minor elements andorganic supplements by Murashige and Skoog, plant growth regulators; 0.2 mg/l IAA, 0.5 mg/l GA, 0.04 mg/l kinetin.

Growing of the isolated meristem will be carried out in artificial light 8000 lux, length of photoperiod 13-14hrs and temperature at night 20-22°c, daytime 24-26°C. the grown plant will be indexed initially for virus at the time they are transferred from the culture medium to soil. A single leaflet will be removed from plantlet and tested by mechanical sap inoculation onto indicator plants, by serological tests, and by electron microscopic examination.

Plants free from virus infection will be multiplied by stem cuttings in test tuber, rooted cuttings transplanted to pots and these in turn will produce more cuttings. Using chemicals (rindit) for dormance period breaking of tubers.

Further during the rainy season (June to September) disease-free plants will be multiplied in field conditions as tubers, as plantlets from tubers, or as stem cuttings. In order to indicate absence of virus infection, during the vegetative period, visible and serological testing will be carried out.

Results and discussions

Nutrient media with the addition of 0.5mg/l GA, 0.2 mg/l IAA, 0.04 mg/l kinetin, pH 5.7, and 0.7% agar Difco is the most favorable for growing isolated meristems for further potato plant multiplication. Within 4-5 months after the isolation of meristems potato plantlets were obtained. Production of plants free from virus infection by heat treatment increased by 27.4%, following heat treatment,however at the same time vitality of meristem on the media decreased. Average percent of vitality with heat treatment was 69.1%, without heat treatment - 87.5% and this depended on variety (Table 1). Size of isolated meristems free from virus infection increased to 0.3 mm due to the heat treatment.

Virus-free plantlets were rapidly multiplied by using the stem cutting method in tubers. Cuttings were planted in solid and fluid media. In fluid media the quantity of major and minor elements ,Fe-helat was reduced ten-fold in comparison with that of agar media, and that of plant growth regulators of 3 mg/l IAA, pH 5.7. All organic components of media were expelled in order to avoid contamination of media. The cuttings planted on a filter-paper bridge formed root systems and shoots within 5-7 days. After 20 days plantlets were already higher than the height of test tuber, then they were cut and were planted in the fluid media again.

Table 1. Influence of heat treatment on meristem vitality and quantity of generated plants free from diseases.

Sample and treatment[2]	Isolated meristems		Disease-free plants	
	N°	Vitality[1]	No	%
A1-204				
HT(38)	33	26	22	85
NHT	24	20	8	40
A1-563				
HT(40)	24	10	10	100
NHT	24	21	16	76
A1-253				
HT(55)	24	20	18	90
NHT	24	22	15	68
Total				
HT	81	56	50	89
NHT	72	63	39	62

1- Index of general vigor.

2- HT = heat treatment, days of treatment in parenthesis.
NHT = no heat treatment.

During the first cutting planting, 15% of media was infected, but for later planting infection of media was not evident. The using of this multiplication technology significantly simplifies the nutrient medium preparation work, transplantation of plantlets into the soil, etc.

The direct growing in the field conditions during the rainy season is possible through multiplication of disease-free potato by stem cuttings. Yields of tubers were 746.4 g per plant. June is the most favorable season in Ambo for planting of rooting cuttings. One mother plant produces an average of 50 cuttings in 40 days.

Rindit (0.5 cm^3/kg of tubers with exposure of 30 hrs) is the most favorable preparation for the interruption of dormancy period of harvested tubers. The period from tuber harvesting until its planting after using of rindit required 24-30 days. Reinfection under field conditions during the rainy season was practically absent. Winged aphids on the potato plants were absent, but wingless aphids were discovered on the lower leaf story to the end of rainy season (September) and averaged from 0,5 to 1 per plant.

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Conclusion

The investigation demonstrates effectiveness of the above-named methods for obtaining and multiplication of disease-free seed material under Ethiopian conditions and makes possible initiation of seed production of disease-free potato stocks.