

Minituber Production Potential of Different Micro Propagated Material under *In Vivo* Conditions of North Central India

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Abstract The experiment was conducted on performance of different micro propagated material under *in vivo* conditions during 2009-10 and 2010-11. Three types of above mentioned micro-propagated seed material viz., micro-plants, <3g minitubers obtained from microplants, and <3 g microtubers of popular variety Kufri Lauvkar was under this study. Experiment was planted in randomized block design and replicated four times. Significantly higher germination/establishment was reported in <3 g minitubers obtained from microplants (93.1%) followed by <3 g microtubers (76.3%) over microplants (48.1%). Significantly higher stems per plant was recorded in <3 g minitubers obtained from microplants (1.2) over other two types of micropropagated materials recorded single stem per plant. By weight, significantly higher

tuber yield was recorded in <3 g minitubers obtained from microplants (2.88 kg per m²) followed by <3 g microtubers (1.96 kg per m²) and least in microplants (1.23 kg per m²). By weight significantly higher per cent of <3 g minitubers was recorded in microplants (4.1) and <3 g microtubers (4.6) over recycled minitubers (1.4). Health wise all the samples from the three types of micropropagated materials were found to be free from five major potato viruses (X, S, M, Y and A). Micro plants/extremely small sized microtubers which cannot be planted directly in field and can be multiplied (i.e. <3 g minitubers obtained from microplants/microtubers) successfully further one time under controlled conditions for improving the size of mini-tubers without any compromise on the health standards of the basic seed material.

Keywords Microplants, Microtubers, Minitubers, Health status, Seed production.

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Introduction

Minituber production is a classical way to multiply or acclimatize *in vitro* material (microtubers or microplants) before they are multiplied in open field [1]. Among the various techniques available under micropropagation, direct *in vivo* planting of *in vitro* generated plantlets (microplants) in soil medium under aphid-proof net/poly houses is well established method for potato minituber production [2]. When microplants or microtubers are grown in net house,

large number of <3 g mini-tubers are produced which is valuable material but cannot be planted in open fields directly because of their small size and need to be recycled for once more under protected condition to improve the tuber size for their effective utilization in the field. However, there is little knowledge about the virus incidence, production potential and seed multiplication rate under net house conditions of microplants, recycled minitubers from microplant and microtubers (micropropagated material largely used for G-0 production under net/polyhouse conditions) through the information about microtubers multiplication directly in the nursery in field is available [3].

An attempt was made to compare the production potential and rate of multiplication of three different micropropagated material viz., micro-plants, <3 g minitubers obtained from microplants, and <3 g microtubers of popular variety Kufri Lauvkar under net house conditions.

Materials and Methods

The experiment was conducted at Central Potato Research Station, Gwalior during 2009-10 and 2010-11. Three types of above mentioned micro-propagated seed material viz., micro-plants, <3g minitubers obtained from microplants, and <3 g microtubers of popular variety Kufri Lauvkar was used for this study. Seed bed was prepared by making one inch thick layer of well decomposed farm yard manure and sand in the ratio of 1:1 on the top of the bed under single door insect-proof net house. The above said seed material was planted at 30 × 10 cm spacing in 2 m rows during last week of October. A light irrigation was given with the help of shower just after planting and subsequent irrigations were given as per requirement. Other package of practices was followed as per recommendation for seed potato crop.

Experiment was planted in randomized block design and replicated four times during both years. The data of both the years were pooled and analyzed statistically and means were separated according to the least significant differences (LSD) at 0.05 level of probability. Ten per cent of the samples were tested for five major potato viruses viz., Potato virus X, Potato virus S, Potato virus Y, Potato virus M and Po-

tato virus A through ELISA (Enzyme Linked Immunosorbent Assay) at full growth stage.

Results and Discussion

Among the micropropagated material, significantly higher germination/establishment was reported in <3 g minitubers obtained from microplants (93.1%) followed by <3 g microtubers (76.3%) over microplants (84.1%). The per cent survival/establishment was significantly influenced by potato cultivar and type of planting material and their interaction under *in vivo* conditions [4]. More than 70% *in vitro* plantlets were survived in direct transplanting under Modipuram conditions except Kufri Pukhraj and Kufri Sutluj [5]. Higher germination in <3 g minitubers obtained from microplants may be due to higher vigor than microplant and microtubers as it has been produced from microplants and had exposed to the climatic conditions for one year.

Significantly higher stems per plant was recorded in <3 g minitubers obtained from microplants (1.2) over other two types of micropropagated materials recorded single stem per plant. No significant difference was recorded among micropropagated materials in case of compound leaves per plant (Table 1). Tuber number per plant was significantly higher in microplants (9.0) followed by <3 g microtubers (7.5), <3 g minitubers obtained from microplants (6.3) but significantly higher yield per plant was recorded in <3 g minitubers obtained from microplants (175.7 g) followed by <3 g microtubers (138.3 g) and least was in microplants (133.7 g). The tuber yield in the <3 g minitubers obtained from microplants may be due to higher vigor i.e. more number of stems per plant (1.2). In case of Kufri Bahar and Kufri Badhsah higher minitubers by number and weight was recorded in *in vitro* plantlet than microtubers when experiment was conducted separately Kumar et al. [6] and Singh et al. [7]. Similar findings were reported in the present experiment. Mean tuber weight was significantly higher in <3 g microtubers (20.9 g) followed by <3 g minitubers obtained from microplants (18.5 g) and least in microplants (14.9 g) (Table 1). Mean tuber weight ranged from 7.8 to 15.0 g when 9 varieties were tested under net house condition for *in vitro* plantlet multiplication Kumar et al. [5].

Table 1. Effect of micropropagated material on growth and yield parameters of minitubers. M₁-Microplants, M₂- <3g minitubers from microplants, M₃ - < 3g Microtuber, SPP-Stems per plant, CLPP-Compound Leaves per plant, TPP-Tuber number per plant, TWPP-Tuber weight per plant, MTW- Mean tuber weight, NTPP-Number of tuber per m², WTPP- Weight of tuber per m², SMR-Seed multiplication rate.

Parameters	Emergence (%)	SPP	CLPP	TPP	TWPP (g)	MTW (g)	NTPP (per m ²)	WTPP	SMR		Percent < 3g tuber	
								(per m ²)	By No.	By Wt.	By No.	By Wt.
M ₁	48.1	1.0	12.7	9.0	133.7	14.9	89	1.23	2.7	12.3	35.0	4.1
M ₂	93.1	1.2	13.5	6.3	175.7	18.5	103	2.88	3.1	28.8	32.7	1.4
M ₃	76.3	1.0	14.4	7.5	138.3	20.9	126	1.96	3.8	19.6	28.8	4.6
SEm	3.67	0.01	0.69	0.46	13.29	2.29	13.9	0.14	0.36	1.23	2.60	0.97
CD (<i>p</i> =0.05)	10.59	0.04	2.00	1.33	38.75	6.62	NS	0.43	1.04	3.55	NS	2.82

In case of tuber yield per m² by number, no significant differences were recorded among the planting materials. By weight, significantly higher tuber yield was recorded in <3 g minitubers obtained from microplants (2.88 kg per m²) followed by <3 g microtubers (1.96 kg per m²) and least in microplants (1.23 kg per m²). Lower tuber number and yield in microplants may be due to lower germination/establishment percent in microplants than other types of micropropagated material.

Seed multiplication rate by number was significantly higher recorded in <3 g microtubers (3.8) over microplants (2.7) (Table 1). Seed multiplication rate by weight was significantly higher in <3g minitubers obtained from microplants (28.8) and <3 g microtubers (19.6) over microplants (12.3). No significant differences was recorded among micro propagated material in case of per cent of <3 g minitubers by number but by weight significantly higher per cent of < 3 g minitubers was recorded in microplants (4.1) and <3 g microtubers (4.6) over recycled minitubers (1.4) (Table 1). All varieties produced 15.76 to 40.05% of < 3 g minitubers in one year recycling [8]. By weight there was no significant difference among micropropagated materials.

Health wise all the samples from the three types of micropropagated materials were found to be free from five major potato viruses (X, S, M, Y and A) during both the years. This indicates that *in vitro* propagated planting material is free from viral diseases in net house (Generation-0) and thus can lead to production of disease-free breeder seed tubers if utmost care is taken while multiplication in Generation-1 and Generation-2.

Conclusion

Growth parameters viz., germination per cent and compound leaves/plant were significantly higher in <3 g minitubers obtained from microplants. Less than 3 g minitubers obtained from microplants recorded highest total yield per m² by weight, highest seed multiplication rate by weight and lowest per cent of <3 g minituber production by weight over other type of micro propagated material. Therefore, it can be recommended that microplants/extremely small sized microtubers which can not be planted directly in field can be multiplied (i.e. <3 g minituber production by weight over other type of micro propagated material). Therefore, it can be recommended that microplants/extremely small sized microtubers which can not be planted directly in field can be multiplied (i.e. <3 g minitubers obtained from microplants/microtubers) successfully further one time under controlled conditions for improving the size of mini-tubers without any compromise on the health standards of the basic seed material.

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