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QUALITY AND YIELD EVALUATION OF MINITUBER PRODUCED BY *IN VITRO* PLANTLETS AND MICROTUBERS IN STUMPY OUTLAY CONSTITUENT CULTURE MEDIA

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ABSTRACT
To evaluate the quality and yield of minituber, both *in vitro* plantlets and microtubers produced in MS and LC media were transplanted to the soil, and observations has been recorded to compare the growth parameters. The maximum number of minitubers (12.4) was produced from microtubers of LC media in comparison to *in vitro* plants of both the MS and LC media. The maximum yield of minituber (439.1 gm) was produced through microtubers of LC media in comparison to *in vitro* plants of both MS and LC media. To evaluate the strength of minituber, fresh and dry weight and percent biomass was also observed. The maximum percent biomass have observed in the minitubers produced from *in vitro* plant of MS media (36.42%) followed by minituber produced from microtuber of MS media (30.22%), minituber from *in vitro* plant of LC media (28.61%) and minituber from microtuber of LC media (28.44%) respectively.

KEYWORDS: Tuber, *in vitro*, MS, LC media, biomass.

INTRODUCTION

The potato is a dicot plant belonging to the family Solanaceae and the genus *Solanum*. This is a large genus and contains 2000 species (Thamburaj and Singh, 2001). Conventional propagation of potato is done vegetatively using seed tubers which ensure uniformity of the crop in terms of growth and yield, but results in degeneration of the crop due to virus infection. The rates of degeneration vary from place to place and from one cropping season to other cropping season (Biniam, 2008). In all potato growing regions the availability of high quality clean seed tuber has been the most limited owing to the conventional clonal propagation that favors disease build-up that drastically reduce yield. Potato seed production programs in many countries have been boosted by using these techniques. In recent years the first multiplication steps in seed production programs are speeded up by using *in vitro* plantlets, micotubers (Bizarri and Ranalli, 1995) or minitubers (Hussey and Stacey, 1981). Generally tuber is used as a seed material for potato cultivation. Due to progressive accommodation of viral disease in potato seed stock, availability of good quality seed is a major constraint in potato production, which is approximately 50% of the total production cost. Beside high cost of seed potato, the productivity is also influence by characterized by low multiplication rate of only 4 – 6 times. Large scale production of clonal material *i.e*. to produce uniform, identical seed material of potato, micropropagation can be the better alternative over conventional propagation of potato (Singh, 1997). By using the technique, which involves low cost components, large-scale clonal material can be produced in short time duration. Use of micropropagation for commercial seed production has moved potato from test tubes to field (Wang and Hu, 1982). Hence to produce the disease free planting material and for decreasing the production cost new methods of propagation are to be derived and adopted. By using the technique, which involves low cost components the large scale clonal material can be achieved in short time duration.

MATERIALS & METHODS

Murashige and Skoog (1962) and Low Cost, these two types of media were used to produce *in vitro* plantlets and microtubers in the laboratory stage of the study, before minituber production. The Murashige and Skoog media is indicate as MS media and Low Cost indicates as LC media. The MS media was composed of micro and macronutrients containing 3% sucrose and 0.8% agar. In LC media, tapioca was substitute of agar and cane sugar was used in the place of sucrose, because of low cost and easy availability. CAN, SSP, MOP and cane sugar were used as low cost media (Chandra *et al.*, 1990). The method for producing minituber from *in vitro* plants has been described by Naik (2005). In this method, 15–20 days old sub-cultured plantlets were kept in poly house for 8–10 hrs for hardening without removing the caps of culture tubes. The hardened *in vitro* plantlets were removed from tube and washed to remove the media. The rooting part was separate out from the plantlet. The lower portion of the shooting part was dipped in rooting hormone (IBA) and planted in the pots having soil: sand: vermin-compost in the ratio of 1: 1:1. Watering was done daily to moist the soil and when the plants established and start growing, normal irrigation was done. Minituber production was optimizing from buried axillary buds. The

crop is allowed to mature and minitubers were harvested. The observations for number of minituber produced per plant and fresh and dry weight of minituber were observed. For minituber production from microtubers, the microtubers were treated with 0.2% of bevistin solution for 5–10 minutes followed by 2 – 3 wash with distilled water and dipped in 1% of GA_3 solution for 24 hrs. Treated microtubers were sown in sterilized potting mixture of soil: sand: vermin compost in the ratio of 1: 1:1 (Naik, 2005). Minitubers were harvested and the data for minituber produced from each microtuber and fresh and dry weight of minituber was observed.

RESULTS

The present investigation was carried out to evaluate the quality and production of potato minituber, produced by *in vitro* plantlets and microtubers in stumpy outlay constituent culture media and the results achieve during the study are express here.

Effect on number of mini tubers produced from *in vitro* plant and micro tuber

The number of minituber produced from each *in vitro* plant of MS media reached 9.8 ±1.7. *In vitro* plant of LC media showed 11.0 ±1.0 minitubers from each plantlet. The number of minituber produced from each microtuber of MS media reported 12.1 ±1.2 minituber and each microtuber of LC media produced 12.4 ±1.1 minituber. Data showed (Table-1) that maximum numbers of minituber were reported by microtubers of LC media in comparison to *in vitro* plants of both MS and LC media. The similar results were found on the microtubers of MS and LC media.

TABLE-1: Number of minituber produced from each *in vitro* plant and microtuber

Media Used	No. of minituber from each *in vitro* plant	No. of minituber from each microtuber
MS	9.8 ±1.7	12.1 ±1.2
LC	11.0 ±1.0	12.4 ±1.1
F Value	3.44*	0.29*
LSD (P< 0.05)	1.11	0.95

**Non Significant*

Effect on yield of mini tubers produced from *in vitro* plant and micro tuber

The yield of minituber produced from each *in vitro* plant of MS media reached 360.7 ±7.7 gm. *In vitro* plant of LC media produced 420.8 ±14.8 gm. minitubers from each plantlet. The yield of minituber produced from each microtuber of MS media reported 370.3 ±5.6 gm. and each microtuber of LC media produced 439.1 ±19.7 gm. minituber. Data showed (Table-2) that maximum yield of minituber was produced by microtubers of LC media in comparison to *in vitro* plants of both MS and LC media.

TABLE-2: Yield of minituber produced from each *in vitro* plant and microtuber

Media Used	Yield (gm) of minituber from each *in vitro* plant	Yield (gm) of minituber from each microtuber
MS	360.7 ±7.7	370.3 ±5.6
LC	420.8 ±14.8	439.1 ±19.7
F Value	129.32*	111.90*
LSD (P< 0.05)	9.14	11.25

**Significant*

Effect on fresh and dry weight and present biomass of mini tubers

To evaluate the strength of minituber, fresh and dry weight and percent biomass were also observed. The fresh and dry weight of each minituber, from *in vitro* plant of MS media, reported 41.69 ±2.6 and 15.21 ±1.8 gm. respectively an biomass was reached 36.42%. The minituber produced from *in vitro* plant of LC media showed 43.66 ±2.1 gm fresh and 12.47 ±2.0 gm dry weight of each microtuber, but the biomass reached least (39.33%) than minituber produced from the plant of MS media (Table-3). Minituber produced from microtuber of MS media showed 45.54 ±2.2 gm fresh and 13.73 ±1.8 gm dry weight with 30.22% biomass. Minituber from the microtuber of LC media have show 47.09 ±1.4 gm fresh and 12.40 ±2.0 gm dry weight with 28.44% biomass (Table-4). The data indicates that maximum percent biomass was observed in the minituber produced from the *in vitro* plant of MS media (36.42%) followed by minituber produced from microtuber of MS media (30.22%), minituber from *in vitro* plant of LC media (28.61%) and minituber from microtuber of LC media (28.44%).

TABLE-3: Fresh and dry weight and percent biomass of each minituber produced from each *in vitro* plant

Media Used	Fresh weight	Dry weight	% Biomass
MS	41.69 ±2.6	15.21 ±1.8	36.42
LC	43.66 ±2.1	12.47 ±2.0	28.61
F Value	2.58*	9.76**	26.7**
LSD (P< 0.05)	1.87	1.51	2.61

**Non Significant, **Significant*

TABLE-4: Fresh and dry weight and percent biomass of each minituber produced from each *in vitro* plant

Media Used	Fresh weight	Dry weight	% Biomass
MS	45.54 ±2.2	13.73 ±1.8	30.22
LC	47.09 ±1.4	12.40 ±2.0	28.44
F Value	3.44*	0.41*	2.50**
LSD (P< 0.05)	1.44	0.87	1.97

**Non Significant, **Significant*

DISCUSSION

In the present study, after microtuber production in both MS and LC media, the harvested microtubers were transplanted to the soil for minituber production. The minitubers were also produced by *in vitro* plant of MS and LC media, and the observations were taken to compare the growth parameters of minitubers produced from microtuber and from *in vitro* plant of MS and LC media (Naik, 2005). Many techniques have been developed during the last decades for producing potato plantlets in aseptic environment. The micropropagation of potato by *in vitro* culture of single node cuttings and other plant tissues are commonly used in the propagation of high genetic and disease-free seed tubers (high quality), germplasm exchange and conservation (Dodds *et al.,* 1992; Gopal and Minocha, 1997; Naik *et al.*, 1998). *In vitro* propagated potato plantlets are commonly used in potato seed production programmes for production of *in vitro* tubers, greenhouse production of minitubers, or field planting. The routine multiplication of *in vitro* plantlets, single node cuttings for example can be used to produce rooted plantlets *in vitro* during the rooting phase. These rooted plantlets are subsequently acclimatized *ex vitro* in a glasshouse to produce plantlets in the field to produces seed tubers or minitubers (Jones, 1988; Struik and Lommen, 1990). In the present study, the observation showed that the maximum numbers of minituber were produced by microtubers of LC media in comparison to *in vitro* plants of both MS and LC media. Similar result was found by the micotubers of MS and LC media to produce the minitubers. The maximum yield of minituber was produced by microtubers of LC media than *in vitro* plants of the MS and LC media. To evaluate the strength of minituber, fresh and dry weight and percent biomass was also observed. The data indicates that maximum percent biomass observed in the minituber produced from the *in vitro* plant of MS media (36.42%) followed by minituber produced from microtuber of MS media (30.22%), minituber from *in vitro* plant of LC media (28.61%) and minituber from microtuber of LC media (28.44%). Ercan *et al.* (2005) have also conducted a study to determine field, greenhouse and seed bed performance of plantlets derived from *in vitro* propagated plantlets of three potato cultivars and observed that yield components, in the field and seed bed plantlets were found lower values than greenhouse plantlets. The percentage of >4 gm tuber weight was obtained for approximately 80% in greenhouse and field plantlets and between 45 to 55% in seed bed plantlets. These results indicated that greenhouse and seed bed potato plantlets can be used effectively to expand production of basic minituber seed stocks. Greenhouse minituber production system involving low inputs of *in vitro* potato plantlets were suggested by Ali *et al.* (2006) in their study also.

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