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EFFECT OF SEEDLING TUBER SIZE AND FERTILIZER LEVELS ON GROWTH, YIELD AND ECONOMICS OF POTATO PRODUCTION

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ABSTRACT: In the present investigation, effect of three seed size of tuberlets of <10, 10-20 and 20-30g and three fertilizer levels of 50, 100 and 150% of recommended dose (RD) of 120:100:100 kg NPK/ ha were studied on growth, yield and economics of potato. Yield of seed size tubers (25-50g) (204.91q/ha) and total yield (424.93q/ha) were higher under the fertilizer level of 180:150:150 kg NPK/ ha with small size tubers i.e. <10g. 10-20 and 20-30g tuberlets performed better yield on fertilizer level of 120:100: 100kg NPK/ ha and ranked second. These seed sizes recorded the highest percentage of ware potato yield (>25 & <50 g) as compared to small size tuberlets. The highest net return of Rs. 68,482 per ha and cost benefit ratio 1:3.16 was recorded with small size tuberlets (<10g) planted on high fertility level (50% above of R.D.) and second best treatment was 10-20g tuberlets at 120:100:100kg NPK/ha (R.D.) which recorded net return Rs.63,496 per ha with cost benefit ratio 1: 3.13.

INTRODUCTION

Traditional potato production is costly owing to use of tubers as seed which is also prone to degeneration. One alternative to seed tuber is use of true potato seed for potato production. Using true potato seed (TPS) to produce seedling tubers in nursery bed and the use of these seedling tubers as planting material for raising a ware crop in areas where potato growing season is short. Proper seed size has great bearing on the growth of potato crop ultimately influencing the tuber yield and economic return. Optimum levels of fertilizer also contribute to growth and yield of potato crop. Although much work has been done (1, 4, 6) on these aspects, information is meagre on high yielding tuberlets of HPS I/ 13 TPS population for the Satpura plateau region of M.P., Hence the present investigation was carried out to determine the optimum size of seedling tubers and fertilizer levels on ware potato production.

MATERIALS AND METHODS

The experiment was conducted under All India Coordinated Potato Improvement Project at Zonal Agricultural Research Station, Chandangaon, Chhindwara during *rabi* season of 1993-94 and 1994-95 on sandy loam soil with pH of 8.0, 0.4 percent organic carbon, 19 kg/ha available P and 579 kg/ha available K. The experiment was laid out in randomized complete block design with four replications during 1993-94 and five replication during 1994-95. Nine treatment combinations of three fertilizer levels (50, 100 & 150% of RD) and three seedling tuber sizes (F_1C_1) of HPS1/13 i.e.<10g, 10-20g and 20-30g were planted at intra row distance of 10 cm, 15 cm and 20 cm, respectively, on 12th November during 1993 and 28th October during 1994. The recommended dose of fertilizer is 120:100:100 kg N, P_2O_5 & K_2O/ha respectively. Full dose of phosphorus as single super phosphate and potash as muriate of potash was incorporated to all plots. Half of nitrogen in the form of urea was applied for basal dressing, and remaining nitrogen was top dressed as per treatments at the time of earthing .The crop was grown under irrigated condition. The crop was harvested at110 days. Germination at 30 days, number of stems per plant at 50 DAP

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and plant height at 50 and 85 days after planting were recorded. The produce of each plot was graded into seed size (25-50 g) and ware potato (above 50g and <25g) categories. Net return and cost benefit ratio were calculated on the basis of investment as per treatment on potato cultivation.

RESULTS AND DISCUSSION

Yield attributes: The plant emergence was not affected significantly due to levels of nutrients application and size of tuberlets. Which ranged from 92.91 to 95.68%. Stems per plant increased non-significantly with increase in seed size of tuberlets and fertilizer levels up to recommended dose i.e. 120:100:100 kg NPK/ha. It may be attributed to increase in the number of eyes. Iritani *et al.* (2) and Khurana *et al.* (5) also reported increase in stems per hill with increase in seed size. Plant height was significantly affected by different treatment combinations at 50 days. Maximum plant height (62.2 cm) was recorded where seedling tubers of 20-30 g were planted with 150% of recommended dose (RD) of fertilizers. Lowest plant height (45.6cm) was recorded in small size tuber planted with 50% RD of fertilizer. Planting of small size tubers (<10g) at high fertility level recorded slight reduction in height (74.2cm) as compared to 20-30 g tuberlets (74.4cm) at 85 DAP. In case of medium size tubers (10-20 g) with high fertility level (i.e. 180:150:150 kg NPK/ha), the plant height was 56.7 cm at 50 DAP. Large seed size tuberlets (20-30g) recorded higher plant height and difference was significant. However at 85 days, small size tuberlets were able to make it up and there was no significant difference among seed tuber size. Better growth from large size tuberlets early in the season attributed to better vigour of plants due to availability of more food material from mother tuber. However small size tuberlets were able to make up for growth as the season advanced. These findings are in agreement with the results of Mahmood and Gill (7).

Tuber yield: Significant difference in tuber yield was observed among different size of tuberlets and fertilizer levels. The average highest total yield of 424.93q/ha was recorded by small size tuberlets (<10g) with high fertilizer level of 180:150:150 kg NPK/ha due to increase in plant population per unit area and proper response to high fertilizer. Kadian *et al*. (3) have also reported that tuberlets produce of < 10g size can be successfully used for potato production. Second best treatment was 10-20 g seed size with 120:100:100 kg NPK/ha which recorded average yield of 394.90 q/ha. Tuber size of <20g can also successfully be used as seed tuber for next season, which gave same potential yield as from seed size of 30-50g (7). In case of size of tuberlets, there was non significant response among all seed sizes, 20-30 g tuberlets recorded slightly higher yield as compared to small size <10 g. The tuber yield ranged from 381 to 384 q/ha, respectively. Significant increase in tuber yield by application of fertilizer up to 180:150:150 kg NPK/ha for small size tuberlets was observed. Singh (8) also reported that 10g size tuberlets recorded highest yield due to increase in plant density, which generally leads to more number of tubers. Fertilizer dose of 120:100:100 kg NPK/ha (RD) was found better for 10-20 and 20g-30g tuberlet size over application of 50% RD of fertilizer in terms of total tuber yield. Seed size of tuberlets and fertilizer levels differ significantly with respect to seed size tuber production (**Table 1**). An increase in fertilizer level upto 150% RD increased yield of seed size tuber with small size tuberlets (<10g over 50% RD). With increase in seedling tuber size on recommended dose of fertilizer, proportion of large size tuber above 50g increased. Similar results have been reported by Khurana *et al.* (5) and Kadian *et al.* (3). Percentage of ware potato yield increased with increase in tuber

Table 1. Effect of seedling tuber size and fertilizers levels on tuber yield and economics

Treatments		Emergence % at 30 days	No. of stem/ plant At 50 DAP	Plant height (cm) DAP		Yield (q/ha)			Cost of produce Rs/ha	Net return Rs/ha	C:B ratio
Seedling tuber size	Fertilizers level (% of RD 120:100: 100 kg NPK/ha)			50	85	Seed size 25-50g	% ware yield of <25 & >50g	Gross yield			
<10 g	50%	94.88	3.2	45.6	64.3	175.50	45.96	324.80	68857.60	49921.60	1:2.36
	100%	94.32	3.5	56.3	70.5	191.46	51.39	393.87	83559.52	63094.50	1:3.08
	150%	95.68	3.8	52.8	74.2	204.91	51.77	424.93	90148.89	68482.12	1:3.16
10-20 g	50%	92.91	3.4	50.4	66.1	144.13	58.57	347.36	73767.52	54735.61	1:2.87
	100%	94.80	4.6	55.6	72.3	164.00	58.47	394.90	83778.08	63496.75	1:3.13
	150%	94.37	4.2	56.7	73.4	163.24	58.54	393.76	83477.12	61248.12	1:2.75
20-30 g	50%	93.39	3.4	52.4	65.2	149.31	58.46	359.47	76207.64	56753.00	1:2.91
	100%	94.02	4.6	60.5	72.5	165.09	58.46	397.46	84321.13	63225.37	1:2.99
	150%	93.65	4.5	62.2	74.4	164.40	58.46	395.79	83907.48	61509.86	1:2.74
CD at 5%		NS	NS	9.2	NS	27.00	-	22.90	-	-	-

size with RD of fertilizer, mainly because yield of tuber size tubers decreased.

Economics: Increase in dose of fertilizer with small size tuberlets increased the net return over 50% recommended dose of fertilizer. Mean net return of Rs. 68,482 /ha was the highest with 180:150:150 kg NPK /ha with small size tuberlets (10g). Next best treatments were RD of fertilizer with both size of tuberlets i.e. 10-20 and 20-30g which recorded net return of Rs. 63,496/- and Rs.63,225/- per ha respectively.

Based on the above results, it can be concluded that all size tuberlets of HPS 1/13 have same potentiality for potato production at fertility level of 120:100:100 kg NPK / ha. However, small size tuberlets perfomed better at higher fertilizer levels (180:150:150kg NPK/ ha) than medium and large size tubers under the agrological condition of Satpura Plateau of Madhya Pradesh.

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