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Grade wise yield and economics involved in potato *c.v* kufri chipsona-1 under different nutrient treatments

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ABSTRACT

The present experiment was conducted at the, Department of Horticulture, College of Agriculture, RVSKVV, Gwalior (M.P.) during the *Rabi* season of two consecutive years 2017-18 and 2018-19. The experiment was comprised of treatments combinations of inorganic fertilizers viz., (100% NPK), (75%NPK) and (50% NPK), farm yard manure and biofertilizers (Azotobacter and PSB) tested on potato processing cultivar Kufri Chipsona-1, for yield and economics parameters. The experiment was laid out in Randomized Completely Block Design (RCBD) with three replications. The tubers were sown in plots of size 3 x 3 m at a spacing distance of 60 x 20 cm. Observations for yield parameters were grade wise yield of tubers (kg/plot), processing grade tuber yield (T/ha), marketable tuber yield and total yield (T/ha) of potato tubers. The treatment combination $I_3O_2B_3$ (100%NPK+FYM 20 t/ha + PSB2.5kg/ha+ Azotobacter 2.5 kg/ha) resulted in maximum 'A' grade tubers (8.2 kg/plot) and maximum 'B' grade tubers (7.5 kg/plot) during the pooled mean data, of the experiment. The treatment combination $I_3O_2B_3$ also resulted in maximum total yield (22.6 t/ha). Whereas minimum total yield (15.6 t/ha) was obtained in treatment $I_1O_1B_2$. The highest benefit cost ratio was recorded (2.56) with treatment $I_3O_2B_3$ followed by (2.47) treatment $I_3O_2B_1$.

Key words : *'A', B', C'grade tubers, Kufri Chipsona-1.*

Introduction

Potato (*Solanum tuberosum* L.) belongs to the family Solanaceae and it is grown across the world for its edible tubers. The probable centre of origin of potato is in South America located in the central Andean region. Potato was introduced, by the Portuguese to India from the Europe in the beginning of the seventeenth century.

Potato produces more edible energy per unit area and time as compared to wheat, rice and maize (Dutt, 2008). The average composition of a potato tuber consists of dry matter (20 %), starch (13-17 %), total sugars (0-2 %), protein (2.2 %), fibre (0.7 %), lipids (0.13 %). In India potato is grown in an area of around 2.17 Million hactare with total production of about 46.54 million tonnes and the productivity is 21.5 tonnes/ha (Horticultural Statistics at a Glance, 2017).

Materials and Methods

The experiment was conducted at the, Horticulture research area, Department of Horticulture, College of Agriculture, Rajmata Vijayaraje Scindia Krishi Vishwa Vidyalaya, Gwalior (M.P.) during the *Rabi* season of two consecutive years 2017-18 and 2018-19. The Experimental site College of Agriculture, Gwalior is situated at 26° 13 N latitude and 78° 14 E longitudes at an altitude of 211.5 m from mean sea level in central part of Madhya pradesh and it has a semi-arid subtropical climate. The experiment was comprised of treatments combinations of inorganic fertilizers viz., (100% NPK), (75%NPK) and (50% NPK), farm yard manure and biofertilizers (Azoto-

bacter and PSB) tested on potato processing cultivar Kufri Chipsona-1, for yield and growth parameters. Pre-planting seed treatment was done with Mancozeb 0.2% solution. The tubers were sown in plots of size 3 x 3 m at a spacing distance of 60 x 20 cm. The observations for yield parameters were taken during harvest to obtain the viz., grade wise yield of tubers (kg/plot), Marketable tuber yield and Total yield (T/ha) of potato tubers. The grade wise yield of tubers was obtained by sorting out total yield into four grades. The grading was done based on weight basis *viz*., A (>75 g), B (50-75 g), C (25-50g), tubers of each grade were weighed separately. The data recorded under the study were subjected to statistical analysis as per standard procedure as suggested by Panse and Sukhatme (1985).

Results and Discussion

Yield attributes

The highest graded tuber yield of ('A', B and 'C grade tubers) (Table 1) was observed under the treatment combination $I_3O_2B_3$ (100%NPK+FYM20t/ha+PSB+Azotobacter), followed by treatment $I_3O_2B_1$(100%NPK + FYM 20 t/ha +Azotobacter 5kg/ha) and treatment $I_3O_2B_2$. Whereas, minimum tuber yield of ('A', B and 'C grade tubers) was seen in treatment $I_1O_1B_1$ (50% NPK + FYM 10 t/ha + Azotobacter 5 kg/ha). The bigger tubers may have formed due to higher supply of photosynthates which got assimilated in the tubers, and induced big size tubers. These results are in close conformity with results obtained by Singh *et al.*(2007) who recorded significantly higher percentage of A and B grade tubers with fertilizers + VAM +Azospirillum. Kumar *et al.* (2012) revealed that with integrated application of 50 % FYM significantly highest yield of 6.76 t/ha of 'A" grade tubers, followed by (11.68 t/ha) of B" grade tubers and (3.41 t/ha) of C" grade tubers yield was obtained. Kumar *et al* (2017b) recorded highest yield of 6.85 kg per plot of 'B' grade tuber (50-75 g) and highest yield of 10.24 kg per plot

Table 1. Grade wise yield of potato under different nutrient treatments.

Treatment Symbol	Treatments	'A' grade yield (Kg/plot)	'B' grade yield (Kg/plot)	'C' grade yield (Kg/plot) T/ha	Marketable tuber yield T/ha.	Total yield
$I_1O_1B_1$	50% NPK + FYM 10 t/ha + Azotobacter 5kg/ha	4.15	4.26	4.33	14.14	16.07
$I_1O_1B_2$	50% NPK + FYM 10 t/ha + PSB 5kg/ha	4.07	4.13	4.23	13.79	15.62
$I_1O_1B_3$	50%NPK+FYM 10t/ha + Azotobacter 2.5 kg/ha + PSB 2.5kg/ha	4.26	4.52	4.18	14.42	15.96
$I_1O_2B_1$	50%NPK +FYM 20 t/ha + Azotobacter 5 kg/ha	4.21	5.14	4.49	15.36	16.80
$I_1O_2B_2$	50%NPK + FYM 20 t/ha + PSB 5 kg/ha	4.25	4.41	4.04	14.44	15.70
$I_1O_2B_3$	50%NPK+FYM20t/ha+Azotobacter 2.5 kg/ha+ PSB 2.5kg/ha	4.59	4.87	4.49	15.48	16.87
$I_2O_1B_1$	75%NPK + FYM 10t/ha + Azotobacter 5kg/ha	4.54	5.26	4.23	15.57	16.84
$I_2O_1B_2$	75%NPK + FYM 10 t/ha + PSB 5kg/ha	5.23	5.57	4.44	16.92	18.53
$I_2O_1B_3$	75%NPK + FYM 10 t/ha+Azotobacter2.5kg/ha + PSB2.5kg/ha	5.54	5.54	4.20	16.94	18.16
$I_2O_2B_1$	75%NPK+ FYM 20 t/ha + Azotobacter 5kg/ha	6.02	4.98	4.28	16.94	18.48
$I_2O_2B_2$	75%NPK + FYM 20 t/ha + PSB 5kg/ha	5.88	5.30	4.14	17.00	18.16
$I_2O_2B_3$	75%NPK + FYM 20 t/ha + Azotobacter 2.5kg/ha+ PSB 2.5kg/ha	6.04	6.06	3.92	17.78	19.05
$I_3O_1B_1$	100% NPK + FYM 10t/ha +Azotobacter 5kg/ha	6.76	6.15	4.17	19.04	19.95
$I_3O_1B_2$	100%NPK + FYM 10t/ha +PSB 5kg/ha	6.99	6.38	3.95	19.22	20.30
$I_3O_1B_3$	100%NPK + FYM 10t/ha + Azotobacter2.5kg/ha + PSB2.5kg/ha	7.47	6.17	3.83	19.28	20.17
$I_3O_2B_1$	100%NPK + FYM 20 t/ha +Azotobacter 5kg/ha	7.30	6.99	3.86	20.35	20.98
$I_3O_2B_2$	100%NPK + FYM 20 t/ha + PSB 5kg/ha	7.15	6.69	3.79	19.85	21.53
$I_3O_2B_3$	100%NPK + FYM 20 t/ha + PSB 2.5kg/ha+ Azotobacter 2.5kg/ha	8.23	7.51	3.80	21.68	22.64
	SEm±	0.197	0.276	0.283	0.404	0.519
	CD	0.591	0.818	0.549	1.141	1.577

Table 2. Economics involved in potato production.

Treatment Symbol	Treatments	Marketable tuber yield (t/ha)	Gross returns Rs/ha	Net returns Rs/ha	B: C ratio
$I_1O_1B_1$	50% NPK + FYM 10 t/ha + Azotobacter 5kg/ha	14.21	141200	62133	1.78
$I_1O_1B_2$	50% NPK + FYM 10 t/ha + PSB 5kg/ha	13.73	137300	58233	1.73
$I_1O_1B_3$	50%NPK+FYM 10t/ha+Azotobacter 2.5kg/ha +PSB 2.5kg/ha	13.69	136900	57833	1.75
$I_1O_2B_1$	50%NPK +FYM 20 t/ha + Azotobacter 5 kg/ha	15.04	150400	69331	1.85
$I_1O_2B_2$	50%NPK + FYM 20 t/ha + PSB 5 kg/ha	14.28	142800	61731	1.76
$I_1O_2B_3$	50%NPK+FYM20t/ha+Azotobacter2.5kg/ha+PSB 2.5kg/ha	14.4	144000	62931	1.78
$I_2O_1B_1$	75%NPK + FYM 10t/ha + Azotobacter 5kg/ha	15.7	157000	75472	1.92
$I_2O_1B_2$	75%NPK + FYM 10 t/ha + PSB 5kg/ha	16.6	166100	84572	2.04
$I_2O_1B_3$	75%NPK + FYM 10 t/ha+Azotobacter2.5kg/ha +PSB2.5kg/ha	15.4	154000	72472	1.90
$I_2O_2B_1$	75%NPK+ FYM 20 t/ha + Azotobacter 5kg/ha	16.62	166200	82672	1.98
$I_2O_2B_2$	75%NPK + FYM 20 t/ha + PSB 5kg/ha	16.07	160700	77172	1.92
$I_2O_2B_3$	75%NPK + FYM 20 t/ha + Azotobacter 2.5kg/ha+ PSB 2.5kg/ha	17.37	173700	90172	2.08
$I_3O_1B_1$	100% NPK + FYM 10t/ha +Azotobacter 5kg/ha	18.08	180800	96812	2.15
$I_3O_1B_2$	100%NPK + FYM 10t/ha +PSB 5kg/ha	18.49	184900	100912	2.20
$I_3O_1B_3$	100%NPK + FYM 10t/ha + Azotobacter2.5kg/ha +PSB2.5kg/ha	18.42	184200	100212	2.19
$I_3O_2B_1$	100%NPK + FYM 20 t/ha +Azotobacter 5kg/ha	19.52	195200	109212	2.27
$I_3O_2B_2$	100%NPK + FYM 20 t/ha + PSB 5kg/ha	20.12	201200	115212	2.33
$I_3O_2B_3$	100%NPK + FYM 20 t/ha + PSB 2.5kg/ha+ Azotobacter 2.5kg/ha	21.31	213100	127112	2.47

of 'A' grade (>75 g) tubers with the application of 150, 80, 50 kg NPK/ha.

Simmilarly treatment $I_3O_2B_3$ resulted in highest total tuber yield (22.64, t/ha, respectively) which was at par to treatment $I_3O_2B_1$, whereas minimum marketable tuber yield were obtained in treatment $I_1O_1B_2$. In this experiment higher yield was obtained with the application of higher dose of NPK, FYM and bioertilizers which lead to overall increase in number of large, medium and small sized tubers which in turn increased the total yield. Whereas biofertilizers treatment provide better absorption of phosphorus as compared to other treatments. Jaipaul (2011); Gavit *et al.* (2010); Dhakal *et al.* (2011), Verma *et al.*, (2013) and Kumar *et al.* (2017) also noticed similar findings in their experiments.

Economics

The highest gross returns (Table 2) was recorded (Rs.220300.0) with treatment $I_3O_2B_3$. Whereas, the minimum gross returns was recorded (Rs. 138500.0) with treatment $I_1O_1B_2$. Similar findings were reported by Dash *et al.*, (2015) who found a maximum net returns of (Rs. 55186) in potato under 75% NPK+ *Azotobacter.* Kumar *et al.* (2015) found maximum net returns of (Rs. 95,937/ha) in potato with high NPK dose. The highest benefit cost ratio was recorded (2.56) with treatment $I_3O_2B_3$ followed by (2.47) treatment $I_3O_2B_1$. Whereas, the minimum benefit cost ratio was recorded (1.77) with treatment $I_1O_1B_2$. These results are in close proximity to the results obtained by Rana *et al.* (2009) in their experiment to study the profitability of processing variety Kufri Chipsona-1 with other varieties and noticed benefit-cost ratio (1.91).Sarkar *et al.* (2011) also obtained a highest B:C ratio (1.34) and net profit and in Kufri Chipsona-1' under NPK i.e. 180:66:125 kg/ ha.

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