Indian Journal of Agronomy **44** (1) : 168–171 (March 1999)

Agronomic manipulations of seed and fertilizers in potato (*Solanum tuberosum*) crop grown in acidic soils of Meghalaya

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Received: August 1995

ABSTRACT

A field trial was conducted during summer season (March–July) of 1992–94 at Upper Shillong to find out suitable and economical combinations of seed rates and fertility levels. Significant increase in tuber yield was recorded up to medium fertility levels (100 : 120 : 50). Further increase in fertility level (150 : 180 : 75) gave only 5.2% more tuber yield. Significant increase in tuber yield was obtained up to 30 q seed/ha. Seed rate increased up to 35 q/ha gave only 3.8% more yield. The inverse relationship was observed between seed rates and multiplication rate. Increase in seed rates decreased the multiplication rate. It was 10.4, 8.5, 7.4, 6.5 and 5.8 times with seed rate of 15, 20, 25, 30 and 35 q/ha respectively. The production of large (> 80 g) and medium (20–80 g) size tubers was significantly increased up to medium fertility level where as seed rate had significant impact only on the production of medium size tubers. The highest tuber yield (221.8 q/ha) was obtained when 35 q seed/ha was grown at higher (150 : 180 : 75) fertility level and gave tuber production in the ration of 25 : 58 : 17 of large, medium and small size tubers respectively. But higher net return was obtained when 25 q seed/ha was supplemented with medium (100 : 120 : 50) fertility level.

Key words : Seed rate, Fertility level, Tuber yield, Tuber size, Net return

In potato production seed and fertiliers are the major inputs, which account for about 65% of the total cost of cultivation. These inputs are the main constraints for potato production in NE region due to non-availability of good-quality seed and proper fertilizers. Little information is available for combined interactions of these major inputs at varying rates. Hence present study was undertaken to evolve suitable agronomic manipulations for these inputs to get good potato production.

MATERIALS AND METHODS

The experiment was conducted during summer season (March–July) of 1992, 1993 and 1994 at Upper Shillong. The soil was sandy loam, rich in organic matter (1.7%) with pH 5.4. The soil had 158, 5.8 and 218 kg/ha of available N, P and K respectively. The experiment was laid out in split-plot de-

Table 1. Effect of fertility levels and seed rates on the potato tuber yield (q/ha)

Fertility level (kg/ha)	Seed rate (q/ha)					
	15	20	25	30	35	Mean
			1992			
50 : 60 : 25	148.2	133.8	151.4	165.9	174.3	148.7
100 : 120 : 50	133.0	154.3	161.9	171.9	178.7	159.9
150 : 180 : 75	142.2	157.1	173.1	184.7	194.7	170.6
Mean	131.1	148.4	162.1	174.1	182.5	
			1993			
50 : 60 : 25	120.6	131.8	139.4	148.2	157.5	139.5
100 : 120 : 50	159.5	171.5	187.9	198.7	203.9	184.3
150 : 180 : 75	170.7	174.3	189.9	199.9	207.9	188.5
Mean	150.2	159.2	172.4	182.3	189.8	
			1994			
50 : 60 : 25	154.7	173.1	181.5	187.9	191.5	177.7
100 : 120 : 50	188.3	206.7	235.2	245.6	256.0	226.4
150 : 180 : 75	210.5	232.0	244.0	256.4	262.8	241.2
Mean	184.6	203.9	220.2	230.0	236.8	
			Pooled (mean of 3 years)			
50 : 60 : 25	131.1	146.2	157.5	167.3	174.4	155.3
100 : 120 : 50	160.2	177.5	195.0	205.4	212.9	190.2
150 : 180 : 75	174.5	187.8	202.3	213.7	221.8	200.0
Mean	155.3	170.5	184.9	199.5	203.0	

		Seed rate (g)	*Fertility level(F)*	*R x F*
CD (P = 0.05)	1992	12.2	15.9	NS
	1993	13.3	16.4	NS
	1994	18.4	25.6	NS
	Pooled	8.0	9.8	NS

sign with 4 replications. Three fertility levels, viz. low (50 : 60 : 25), medium (100 : 120 : 50) and high (150 : 180 : 75) kg of N, P_2O_5 and K_2O/ha respectively were alloted to main plots and 5 seed rates (15, 20, 25, 30 and 35 q/ha) to subplots. Well-sprouted tubers of 30–40 g size of cv. 'Kufri Jyoti' was planted in the second week of March at 60 cm row spacing. Half of the N and full of P, K were applied with 10 tonnes farmyard manure/ha at planting and half N at earthing time, recommended plant-protection measures were adopted to save the crop from late blight and insect pests. The tubers were lifted from the field after full maturity in the second week of July during all the 3 years. The produce of each plot graded into 3 grades, large (> 80 g), medium (20–80 g) and small (< 20 g) size tubers and weighed seperately. Net return was calculated taking prevalent seed and fertilizers cost during 1994.

RESULTS AND DISCUSSION

Tuber yield

The tuber yield was significantly increased up to medium fertility level (100 : 120 : 50) during all the 3 years (Table 1). The pooled results indicate that further increase in fertility level (150 : 180 : 75) gave only 5.2% more tuber yield. Sharma and Singh (1988), Abdul and Kumaraswamy (1993) also reported similar results. Significant increase in tuber yield was obtained up to 30 q seed/ha. Increase in seed rate up to 35 q/ha gave

Table 2. Effect of fertility levels and seed rates on production of tuber size (yield q/ha mean of 3 years)

Fertility level (kg/ha)	Seed rate (q/ha)					
	15	20	25	30	35	Mean
			Large (> 80 g)			
50 : 60 : 25	39.3	42.9	39.6	36.7	34.5	38.6
100 : 120 : 50	52.4	55.2	57.0	56.0	53.9	54.9
150 : 180 : 75	56.5	58.2	62.4	57.4	55.5	58.0
Mean	49.4	52.1	53.0	50.0	48.0	
			Medium (20–80 g)			
50 : 60 : 25	69.1	76.8	88.2	96.7	104.3	87.0
100 : 120 : 50	80.8	92.7	105.8	111.8	120.2	102.3
150 : 180 : 75	85.2	97.8	107.6	121.0	127.5	107.8
Mean	78.4	89.1	100.5	109.8	117.3	
			Small (< 20 g)			
50 : 60 : 25	22.7	27.1	29.7	33.9	35.6	29.8
100 : 120 : 50	27.0	29.6	32.2	37.6	38.8	33.0
150 : 180 : 75	30.8	31.8	32.3	35.3	38.8	38.8
Mean	26.8	29.5	31.4	35.6	37.7	
			Seed rate (R)	*Fertility (F)*		*R x F*
CD (P = 0.05)	Large		NS	7.8		NS
	Medium		10.3	12.1		NS
	Small		NS	NS		NS

Table 3. Effect of fertility levels and seed rates on net return (Rs/ha) of potato cultivation (based on pooled yield)

Fertility level (kg/ha)	Seed rate (q/ha)					
	15	20	25	30	35	Mean
50 : 60 : 25	8,220	8,990	9,000	8,710	7,880	8,560
100 : 120 : 50	12,310	13,500	14,750	14,580	13,830	13,794
150 : 180 : 75	13,400	13,750	14,460	14,490	13,860	13,992
Mean	11,310	12,080	12,736	12,593	11,857	
			Seed rate (R)	*Fertility (F)*		*R x F*
CD (P = 0.05)			535	653		NS

Cost of nutrients (Rs/kg) : N 7.25, P_2O_5 Rs. 20 and K_2O Rs. 7.60
Cost of seed : Rs 450/q
Cost of FYM : Rs 1500/ha
Cost of labour and other inputs : Rs 5,500
Cost of plant protection measures : Rs 2,500
Sale price of potato : Rs 200/q

only 3.8% higher tuber yield which was statistically at par with 30 q seed/ha. The results are in agreement with the findings of Singh *et al.* (1993). The inverse relationship was observed between seed rates and multiplication rate. The highest multiplication rate was 10.5 times with 15 q seed/ha and lowest 5.8 times with 35 q seed/ha. The multiplication rate for other seed rate was 8.5, 7.5 and 6.5 times with 20, 25 and 30 q seed/ha respectively. This lend to support the findings of Shekhon and Singh (1985) and Singh (1992). It is evident from the results that similar yields could be obtained on low fertility level with

higher seed rates or higher fertility level with lower seed rate. Hence the results indicate that if one of the inputs is in scarce, yield could be compansated with the increased use of other input, although maximum yield was obtained when both inputs were applied at highest level.

Tuber size

The production of large (> 80 g) and medium (20–80 g) size tuber was significantly increased up to medium fertility level (Table 2). Further increase in fertility level marginal increase was observed in all the 3 grades. Increasing seed rates had impact only on the production of medium size tubers and significant increase was recorded up to 25 q seed/ha. Production of small (< 20 g) size tubers did not affect by seed rates or fertility levels. The highest-producing treatment gave the tuber production in the ratio of 25 : 58 : 17 of large, medium and small size tubers respectively, whereas lowest-producing treatment gave in the ratio of 30 : 53 : 17, which corroborate the finding of Singh (1992).

Economic feasibility

The significant increase in net profit was obtained up to medium fertility level after that marginal increase was observed (Table 3). Increase in seed rate up to 25 q/ha gave significant increase in net return but further increase in seed rate reduced the net return although significant increase in tuber yield was obtained up to 30 q seed/ha. Economic point of view 25 q seed/ha with medium (100 : 120 : 50) fertility level was the best combination for potato cultivation or choose among other combination, if one of the inputs is available in scarce quantity or change in input or produce prices.

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