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Influence of seed rate on the productivity of garden pea under dry temperate conditions of Himachal Pradesh

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Abstract

Farmers of Lahaul were using upto four times higher seed rates of peas which was not only their concern but of the scientists and the policy makers. Therefore, seed rates (100, 150, 200, 250, 300 and 350 kg/ha) with recommended (20:60:30 :: kg $N:P_2O_5:K_2O$/ha) and 150% NPK were evaluated at Highland Research and Extension Centre, Kukumseri during 2010 and 2011 to find out optimum seeding rate of peas under dry temperate region of North-western Himalayas. It was observed that emergence count and final plant stand of peas increased with increase in the seed rate upto 300 kg/ha during 2010 and upto 350 kg/ha during 2011. Pods/plant was also significantly affected during 2010. But there was consistent decrease in pods/plant beyond the seed rate of 150 kg/ha. Seeds/pod and seed weight/pod were not significantly affected during both the years. Peas green pod yield was significantly increased upto a seed rate of 250 kg/ha during 2010 and at 200 kg/ha during 2011. Yield attributes and yield of peas were not significantly influenced due to fertility levels.

Key words: Seed rate, productivity, garden pea, temperate conditions.

Proper seeding rate is important for optimizing the yield and economic return for garden pea. Seed constitutes a major input cost for garden pea production, especially for large seeded varieties. Optimum seeding rate should maximize yield but at same time should not increase the seed input cost. Peas are a "plastic" crop, able to compensate for low plant densities with increased branching and pod set. But in spite of this, higher seeding rates, usually 2-2.5 times the normal rate not only in peas but in other crops as well, are generally used to smother weeds (Rana et al. 2004), compensate damage from insect-pests and birds and above all to ensure proper plant stand for economic returns in dry temperate zone. Seed production particularly in case of garden peas is almost negligible in the dry temperate region and farmers depend entirely on outside seedy supply (Kumar *et al.* 2006). The major supplier of seed and the agency responsible for agricultural development in the region is HP State Department of Agriculture. It was its concern to validate seeding rate in case of peas under such a scenario. Keeping the fact in mind, the present investigation was undertaken to find out optimum seeding rate with optimum supply of nutrients under dry temperate conditions of Himachal Pradesh.

Materials and Methods

A field experiment was conducted in a permanent layout for two consecutive summer seasons (2010 and 2011) at Highland Research and Extension Centre, Kukumseri to find out optimum seeding rate of peas under dry temperate region of North-western Himalayas. Six seed rates (100, 150, 200, 250, 300 and 350 kg/ha) with recommended (20:60:30 :: kg $N:P_2O_5:K_2O$/ha) and 150% of recommended NPK (Table 1) were evaluated in randomized block design with three replications. The peas cv. Azad P-1 was sown on 22 May and 14 May

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and harvested on 26 July and 22 July during 2010 and 2011, respectively. The soil of the experimental field was sandy loam in texture, with organic matter content of 0.62% and pH 6.8. The soil had initial status of available N, P and K of 190, 39 and 156 kg/ha, respectively. Except fertility treatments, the crop was sown with recommended package of practices under irrigated condition (CSKHPKV, 2007). Snow-melt water, the only source of irrigation was used to irrigate crops through sprinklers, rain gun or *Kuhl*. The rest of the management practices were in accordance with the recommended package of practices. The crops were harvested from net plot. Green pod yields were obtained in three pickings. Economics of treatments was computed based on prevalent prices

Results and Discussion

The data on yield attributes and yield of peas are summarized in Table 1. A perusal of data revealed that emergence count of peas and plant population at harvest increased with increase in the seed rate upto 300 kg/ha during 2010 and upto 350 kg/ha during 2011. This was quite obvious because use of more seed would likely to give more population. The non-significant difference between seed rate of 300 and 350 kg/ha during 2010 may be ought to crowding between plants. The emergence (r=0.980 and 0.962 during 2010 and 2011, respectively) and plant stand (r= 0.983 and 0.964) at final harvest was significantly associated with the seeding rate used. There was also significant positive association between emergence and plant stand at final harvest (r= 0.998 and 0.999 during 2010 and 2011, respectively). The values of emergence count and final stand were higher in the second growing season compared with the first growing season. Conversely, pods per plant, seeds per pod, seed weight per pod and green pod yield were higher during the first growing season than the second growing season. These results indicated that yield and yield components were greatly influenced by environmental factors. These results are in agreement with results from Anlarsal et al. (2001), and Bilgili et al. (2010) who reported that yield and yield components were significantly affected by years.

Table 1. Effect of varying seed rate and fertility levels on the yield and yield parameters of pea at Kukumseri during 2010 and 2011

Treatment	Emergence count (m^2)		Final plant stand (m^2)		Pods per plant		Seeds per pod		Seed weight per pod		Green pod yield (kg/ha)	
	2010	2011	2010	2011	2010	2011	2010	2011	2010	2011	2010	2011
Seed rate (kg/ha)												
100	11.9	39.5	8.0	36.8	8.95	3.40	7.11	5.83	3.96	2.95	3541	4208
150	16.5	54.5	12.1	51.7	9.83	3.40	7.48	6.33	4.15	3.05	5034	5111
200	25.8	68.1	19.9	65.5	7.18	3.05	6.78	6.50	3.43	2.88	8368	5874
250	34.5	65.8	28.6	63.8	5.76	2.68	7.01	6.33	3.86	2.99	12696	6041
300	45.4	74.5	39.9	71.8	6.00	2.98	6.97	6.66	3.77	2.70	13194	5874
350	44.8	87.3	40.3	85.0	5.68	2.82	5.95	6.50	3.38	2.85	11319	5957
CD(P=0.05)	2.5	9.9	1.9	9.8	0.57	NS	NS	NS	NS	NS	1336	541
Fertility level												
100% NPK	29.1	67.4	24.5	64.5	7.33	2.95	6.87	6.33	3.81	2.88	9320	5374
150% NPK	30.5	62.5	25.1	60.3	7.14	3.16	6.90	6.38	3.72	2.93	8730	5647
CD(P=0.05)	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS

Pods per plant were also significantly affected during 2010. But there was consistent decrease in pods per plant beyond the seeding rate of 150 kg per hectare. The pods per plant were negatively associated with seed rate (r= -0.880 and -0.817 during 2010 and 2011, respectively, showing inter-plant competition for this character. Seeds per pod and seed weight per pod appears to be more likely influenced by genetics and were not significantly affected during both the years. Peas green pod yield was significantly increased upto a seed rate of 250 kg per hectare during 2010 and at 200 kg/ha during 2011. However, the relationship between green pod yield and seed rate (r= 0.891 and 0.830), emergence count (r= 0.940 and 0.881) and final plant stand (0.992 and 0.884) was positive and significant. Togay et al (2008), Cokkizgm and Colkesen (2007) and Yucel (2013) also reported significant and positive association between yield and yield components.

The response of green pod yield could be explained by quadratic equations and also to increasing plant density. Fig 1 & 2 revealed a peak green pod yield at approximately 345 kg/ha seeding rate corresponding to 60 plants per m^2 at final harvest

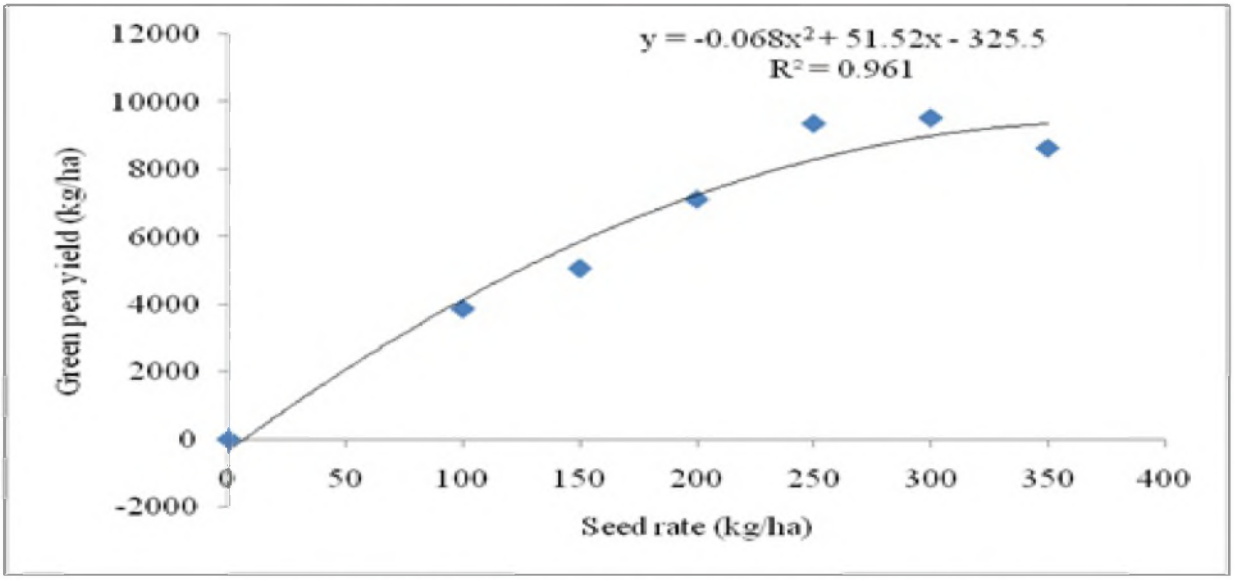

Fig 1. Relationship between seed rates and green pea yield

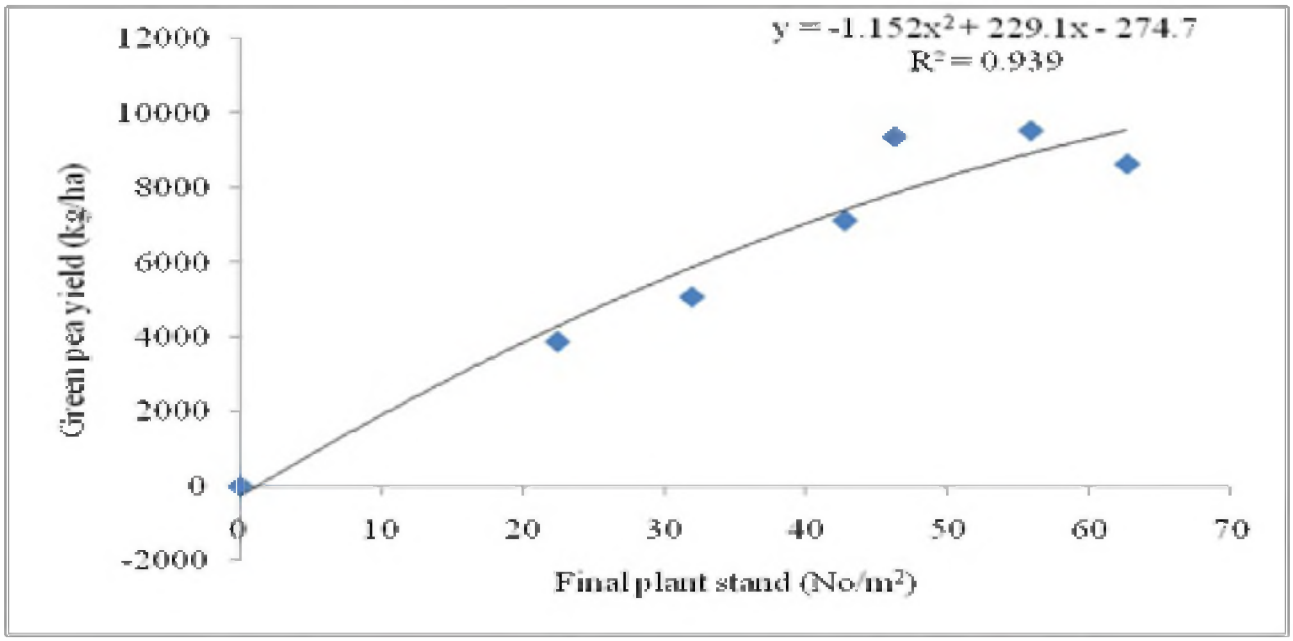

Fig 2. Relationship between final plant stand and green pea yield

in the temperate type conditions. As seeding rate increased from 100 kg/ha to 345 kg/ha, green pod yield of peas increased by 125% in the combined of the two years. Further increases in the seeding rate results in additional input cost, but increasing seeding rate does not significantly return an increase in green pod yield. These results are in agreement with results of Gan (2003) who reported that the seed yield of dry pea increased with increasing plant population densities from 30 to 80 plants/m^2 and optimum plant population for maximising seed yield was 60 to 70 plants/m^2 for dry pea. The similar finding has been reported earlier by Yucel (2013) for garden pea.

Being a leguminous crop, fertility levels could not significantly influence yield attributes and yield of green peas. Thus it is clearly evident that with higher seeding rate there is no need to apply higher doses of fertilizers rather the recommended dose is enough.

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