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Short Note

Influence of seed soaking with phosphorus, neem and seaweed extract on the productivity of pea under Lahaul valley conditions of Himachal Pradesh

M. C. Rana, S. S. Rana, Sanjay K. Sharma, Suresh Kumar and G. D. Sharma
Department of Agronomy
CSK Himachal Pradesh Krishi Vishvavidyalaya, Palampur- 176 062, India.

Pea (*Pisum sativum*) has great potential in Himachal Pradesh both for grain and vegetable production. In Lahaul valley, it is the most important crop in summer fetching premium prices. Being a leguminous crop, its phosphorus requirement is higher. Seed soaking and coating with nutrients solutions especially phosphorus have been advocated to increase the crop yields (Ghosh *et al.*, 1997; Joseph, 1991; Badole *et al.*, 1992). This practice not only helps in supplying the initial need of phosphorus and in reducing the overall requirement of phosphorus but has been considered economic in comparison to the addition of solid fertilizers. The increasing production cost of fertilizers is also stressing to substitute a part of the nutrient requirement through bio-fertilizers or other organic sources of nutrients to make pea production an economically viable proposition. In this endeavour, 'crop neem' (an organic fertilizer made up of 100% neem cake) besides serving as a source of nutrients in agriculture (Singh *et al.*, 2004; Balasubramaniyan, 2004) has been claimed to have insecticidal (Mittal and Ujagir, 2005) and herbicidal activity as well. The role of seaweed as a source of nutrients and as a growth promoting substance has also been established (Datta *et al.*, 2003; Saravanan *et al.* 2003; Shankar *et al.*, 2001). The information on these aspects especially under Lahaul valley conditions of Himachal Pradesh is lacking. Therefore, the present investigation was undertaken.

A field experiment was conducted for two consecutive summer seasons of 2001 and 2002 at the research farm of Highland Agricultural Research and Extension Centre, Kukumseri (32°44′15′′ N latitude, 76°41′23′′ E longitude and 2772 m altitude). The soil of experimental field was sandy loam in texture, rich in organic matter (2.6%) with pH 6.8. The soil had available N 250 kg/ha, available P 19.4 kg/ha and K 217 kg/ha. The crop was sown on June 13 and June 10 during 2001 and 2002, respectively. Crop was sown at 45 cm row spacing using 80 kg seed/ha. Variety 'Ageta Matter' was sown during both the years. Twelve treatment combinations comprising of two seed soaking treatments, three 'crop neem' rates and two seaweed extract spray treatments (Table 1) were tested in randomized block design with three replications. Seaweed extract was applied at 22.5 g a.i./h through 'Powerplus' (liquefied seaweed extract, 4.5% processed in Lacto Bacilli medium, a natural organic product and crop yield enhancer), a Gold Agro Product. Neem was applied through 'Crop Neem', a J.K. Chemicals and Fertilizer's Product having N 2.4%, P 3.0%, K 1.6%, Ca 2.5%, Mg 2.6%, S 1.3%, Fe 0.04 ppm, Cu 0.02 ppm, Zn 0.07 ppm and Mn 0.03 ppm. Pre-emergence spray of pendimethalin at 1.20 kg/ha was done immediately after sowing of the crop with manually operated knapsack sprayer fitted with flat fan nozzle using 800 l water/ha. All the management practices were in accordance with the recommended package of practices. Yields were harvested from net plot (3.6 m x 3.0 m).

Plant population was affected significantly owing to water soaking treatments (Table 1). Seed soaking in 2% solution of phosphorus resulted in significantly higher plant stand as compared to water soaking. Higher plant population was owed to increased plant height due to seed soaking with 2% P solution as compared to water soaking alone. It indicated competition for light (Reddy and Reddi, 1992). By virtue of meeting out the initial need of phosphorus, pod/plant, seeds/pod and test weight and thereby seed yield tended to be significantly higher following seed soaking with 2% P over the water soaking treatment. Seed yield owing to seed soaking with phosphorus solution was 23.94% higher over water soaking alone. Joseph (1991) and Badole *et al.* (1992) have reported similar findings.

In the dry temperate zone, straw is an indispensable item for feeding livestock during winter and seed soaking with phosphorus solution resulted in 22.97% higher straw yield of

Table 1. Effect of treatments on growth, yield attributes and yield of peas (Mean of 2001 and 2002)

Treatments	Plant Population (No./m^2)	Plant height (cm)	Pods/plant (No.)	Seeds/pod (No.)	1000-seed weight (g)	Seed yield (q/ha)	Haulm yield (q/ha)
Soaking							
Water soaking	27.2	28.1	4.5	3.4	89.8	7.1	7.4
P (2%) soaking	29.4	30.3	4.9	3.9	95.8	8.8	9.1
LSD (P=0.05)	0.5	0.4	0.1	0.1	1.5	0.2	0.2
'Neem' (kg/ha)							
100	27.3	28.3	4.4	3.4	89.1	7.2	7.4
125	28.6	29.2	4.7	3.7	92.5	8.0	8.3
150	29.0	30.1	5.0	3.9	96.8	8.7	9.0
LSD (P=0.05)	0.6	0.5	0.1	0.1	1.8	0.2	0.3
'Seaweed extract'							
Spray (22.5 g a.i./ha)	28.6	29.6	4.8	3.8	94.8	8.3	8.5
Control	28.0	28.8	4.5	3.6	90.8	7.7	8.0
LSD (P=0.05)	0.5	0.4	0.1	0.1	1.5	0.2	0.2

pea over the water soaking treatment. Plant population, plant height, yield attributes and yield of pea were significantly affected due to application of neem. There was progressive increase in growth and yield contributing traits and yield of pea with increasing doses of neem. However, plant stand at harvest under the application of neem at 125 and 150 kg/ha, was statistically at par. At 150 kg/ha, neem recorded 20.8 and 8.8% higher seed yield of pea over its rate at 100 and 125 kg/ha, respectively.

Seaweed extract is known to have plant growth regulating activity (Datta *et al.*, 2003; Saravanan *et al.*, 2003; Shankar *et al.*, 2001). In the present investigation, application of seaweed extract at 22.5 g a.i./ha resulted in significantly higher plant stand, plant height, pods/plant, seeds/pod, test weight and seed and straw yields. Seaweed extract resulted in 7.8% higher seed yield over the control treatment.

Present investigation conclusively inferred the importance of seed coating with phosphorus at 2 per cent, neem at 150 kg/ha and seaweed extract at 22.5 g a.i./ha for higher and sustainable productivity of pea under dry temperate region of Himachal Pradesh.

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