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Short Note

Influence of variety and seed soaking with phosphorus on the productivity of rajmash (*Phaseolus vulgaris* L.) under Lahaul valley conditions of Himachal Pradesh

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Rajmash (*Phaseolus vulgaris* L) has great potential both for grain and vegetable purpose in Himachal Pradesh in general and Lahaul valley in particular. Lahaul valley is endowed with mild summers and cool winters. The valley remains snow bound from mid November to March. Intense sun, high diurnal variation in temperature, high wind velocity, low humidity, scanty rainfall and high evaporation are the other features of climate. 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 information on this aspect especially under Lahaul valley conditions is lacking. Therefore, seed soaking and coating with phosphorus has been evaluated in relation to prevalent varieties under cultivation in the valley.

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 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 mean monthly temperature ranged between 20.9 to 24.3°C and 16.8 to 25.0°C in 2001 and 2002, respectively. During its life cycle crop received 198 and 283 mm rainfall during 2001 and 2002, respectively. The crop was sown at 35 cm row spacing using 80 kg seed/ha on June 13 and June 10 during 2001 and 2002, respectively. Twelve treatment combinations as per details in Table 1 were tested in randomized block design with three replications. Overnight water soaking of seed with and without single super phosphate at 2% was done to impose seed soaking treatments. Pre-emergence spray of pendimethalin at 1.20 kg/ha was done for weed control. All the management practices were in accordance with the recommended package of practices.

Wet seeding recorded higher germination as evident from the final plant stand, which was significantly higher than dry seeding (Table 1). The comparative higher plant population tended to increase plant height significantly showing competition for light.

Table 1. Effect of treatments on growth and yield attributes of rajmash

Treatment	Plant population (000/ha)	Plant height (cm)		Pods/plant		Seeds/pod	
		2001	2002	2001	2002	2001	2002
Seed soaking and coating							
Dry	269.8	45.8	46.8	12.9	12.7	4.7	4.9
Wet	273.3	47.4	48.3	13.3	13.6	4.9	5.0
SSP	275.8	48.5	49.1	13.6	14.3	5.1	5.3
CD (P=0.05)	0.6	0.5	0.6	0.2	0.2	0.1	0.2
Variety							
Kanchan	272.2	47.4	47.4	13.1	13.3	4.9	5.1
Him-1	273.1	44.7	45.6	12.0	12.5	4.5	4.8
Triloki	272.9	49.0	49.0	14.3	14.1	5.3	5.2
Baspa	273.5	47.7	50.2	13.7	14.2	5.0	5.2
CD (P=0.05)	0.6	0.6	0.7	0.2	0.3	0.1	0.2

Pods/plant and seeds/pod were significantly higher due to wet seeding over dry seeding. The growth and yield contributing traits were reflected in seed and haulm yields of rajmash, which were significantly higher owing to wet seeding over dry seeding (Table 2). Higher seed and straw yields increased net return and benefit: cost ratio significantly owing to wet seeding over dry seeding. The growth and yield contributing traits, seed and haulm yields, net return and benefit: cost ratio were further improved owing to seed coating and soaking with 2% single super phosphate (SSP) solution. This may owe to immediate availability of phosphorus which stimulated early root growth and nodulation (Teixeira *et al.* 1999). Improvement in yield attributes and yields of legumes due to seed soaking and coating with nutrient solutions have also been documented by Joseph (1991) and Badole *et al.* (1992). Seed soaking and coating with 2% SSP solution gave 271 kg/ha more seed yield and Rs 6300/ha more net return over dry seeding.

Varieties 'Baspa' and 'Him-1' had higher final plant population than 'Triloki' and 'Kanchan'. 'Baspa' and 'Triloki' were comparatively taller. These were followed by 'Kanchan'. Pods/plant and seeds/pod were higher in variety 'Triloki' followed by 'Baspa'. Owing to the highest yield attributes, 'Triloki' resulted in highest seed yield. The straw yield, net returns and benefit: cost ratio were also highest in 'Triloki'. This was followed by 'Baspa', 'Kanchan' and 'Him-1' for yield attributes, yields and net returns and benefit: cost ratio. 'Triloki' had 18.5, 13.3 and 4.5% higher seed yield and fetched Rs 11158, Rs. 8429 and Rs. 3058 more net returns than 'Him-1', 'Kanchan' and 'Baspa', respectively. Rajmash shed most of its leaves by the time harvesting is done. However, time of shedding of leaves is also influenced by management and environmental conditions. Therefore, the harvest index was significantly varied due to varieties under study. 'Triloki' had highest harvest index during 2001 followed by 'Baspa' and 'Kanchan'. During 2002, Baspa, Kanchan and Him-1 being at par resulted in significantly higher harvest index over 'Triloki'. The present investigation inferred that seed soaking and coating with 2% SSP was a good practice making rajmash cultivation an economically viable venture irrespective of the varieties under evaluation. 'Triloki' and 'Baspa' out yielded the other varieties.

Table 2. Effect of treatments on yield and economics of rajmash

Treatment	Seed yield (kg/ha)		Straw yield (kg/ha)		Harvest index		Net return (Rs/ha)	B:C ratio
	2001	2002	2001	2002	2001	2002		
Seed soaking and coating								
Dry	2647	2678	3045	3110	0.465	0.468	40908	1.84
Wet	2804	2812	3206	3253	0.466	0.468	44309	1.99
SSP	2933	2933	3343	3375	0.467	0.468	47208	2.11
CD	70	102	75	105	NS	NS	1904	0.09
Variety								
Kanchan	2639	2729	3033	3150	0.465	0.473	41374	1.85
Him-1	2528	2607	2930	3037	0.463	0.471	38645	1.73
Triloki	3167	2917	3564	3363	0.470	0.450	49803	2.23
Baspa	2844	2977	3263	3433	0.466	0.477	46745	2.10
CD (P=0.05)	81	118	87	122	0.002	0.007	2199	0.10

Seed, Rs 22/kg; Straw, Rs 1.50/kg

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