Short Communication

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Influence of associate crops on forage yield of Berseem *(Trifolium alexandrinum)* in relation to phosphate fertilization

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Abstract

Two levels of phosphorus (0 and 60 kg/ha) and six associated treatments comprising of two component crops (maize and mustard) with berseem were studied during the *Rabi* season, 2008-09 at Hyderabad to work out suitable phosphorus levels and associate crops. The application of phosphorus @ 60 kg/ha recorded better growth parameters of berseem than 0 kg/ha phosphorus. Among the associate crop treatments, sole berseem recorded maximum growth parameters whereas the component crops did not show any significant variation due to dPôlevels and with berseem association. Maximum total green fodder yield (250.91) q/ha of berseem was recorded with the application of phosphorus @ 60 kg/ha. Among associate crop treatments, sole berseems recorded maximum forage yield 262.02 q/ha, while the maize associated treatments were at par.

Keywords: Associate crops, Berseem, Forage yield, Phosphorus application.

Berseem (Egyptian clover, *Trifolium alexandrinum*) is a leguminous fodder known for high forage yield and quality. Lactogenic nature and suitability to feed *ad libidum* makes it a crop beyond compare with any other fodder crop. The initial 1st cut forage yield of berseem is low. To augment the first cut forage yield, one of the best options is intercropping. It is a tool for efficient utilization of available resources to increase forage production from unit land area. As maize (*Zea mays*) is having photo insensitive, lactogenic nature and monocarpic habit, its association as intercrop with berseem deserves consideration. Phosphorus fertilization plays a vital role in berseem as it improves root growth, which helps in formulation of nodulation and nitrogen fixation. Thus to sustain higher forage yield and quality, proper dosage of phosphorus fertilizer is necessary.

The experiment was conducted at the Studentôs Farm, College of Agriculture, Rajendranagar, Hyderabad during *Rabi* season 2008-2009. The soil of the experimental site was sandy loam, slightly alkaline (pH 8) with 0.68% organic carbon (medium), 250.8 kg/ha available nitrogen (medium), 12.9 kg / ha available phosphorus (low) and 297.5 kg/ha available potassium (medium). The field experiment was laid out in factorial randomized block design and replicated thrice. The treatment were two levels of phosphorus *viz.,* 0 and 60 kg/ha and six associate crops combination *viz.,* Sole berseem, Sole maize, Berseem + mustard (*Brassica juncea*) line sown at recommended seed rate (10:2), Berseem + maize as intercrop at 1.5 m interval in berseem, Berseem + maize as intercrop at 3.0 m interval in berseem and Berseem+ maize around the bunds of berseem. Berseem variety JB ï 1, maize variety African Tall and mustard variety Agarni were used in study. The spacing maintained for sowing of both the crop was maize 30cm x 10cm and berseem 30cm x solid rows. 20 kg N and K_2O 40 kg/ha was uniformly applied in berseem and mustard. Phosphorus was applied as per the treatments (0 and 60 kg/ha). A uniform dose of N 120, K_2O 40 kg/ha and phosphorus as per the treatments was applied in maize. First cut of berseem was taken up at 65 days after sowing and subsequent second cut and third cut were taken up 27 days after the first cut and second cut respectively. Maize was harvested at 65 days after sowing along with berseem. Benefit-cost ratio was computed using the following formula:

$$\text{Benefit: Cost ratio} = \frac{\text{Net returns (Rs.)}}{\text{Cost of cultivation (Rs.)}}$$

Berseem equivalent yield was computed using the following formulae:

$$\text{Berseem equivalent yield (kg/ha)} = \frac{\text{Yield of maize/mustard x prevailing market price of maize/mustard}}{\text{prevailing market price of berseem}}$$

Table 1. Growth characters, yield and economics of berseem as influenced by phosphorus level and associate crops

Treatment	Berseem		As. crop yield (q /ha)	L:S ratio	CP content (%)	CF content (%)
	Total GFY (q /ha)	Seed yield (Kg/ha)				
Phosphorus levels (kg/ha)						
P_0	232.18	219.33	125.84	0.63	16.75	15.33
P_{60}	250.91	235.60	136.73	0.65	17.00	15.68
S.Em ±	5.40	2.45	1.19	0.01	0.34	0.09
C.D at 5 %	16.05	7.29	3.56	NS	NS	0.26
Associate crops						
Sole berseem	262.02	246.83	-	0.66	17.34	15.56
Sole maize	-	-	327.62	-	-	-
Berseem mixed with mustard	172.17	174.33	126.50	0.59	15.42	15.56
Berseem + maize as intercrop at 1.5 m interval in Berseem	255.88	235.16	73.24	0.65	17.22	15.41
Berseem + maize as intercrop at 3.0 m interval in Berseem	257.79	237.33	60.93	0.65	17.14	15.56
Berseem + maize around the bunds of berseem	260.30	243.66	68.13	0.65	17.26	15.44
S.Em ±	8.54	3.87	1.89	0.02	0.54	0.14
C.D at 5 %	25.38	11.52	5.66	0.05	NS	NS

	BEY (q/ha)	Gross Returns (Rs/ha)	Cost of Cultivation (Rs/ha)	Net return (Rs/ha)	B:C ratio
Phosphorus levels (kg/ha)					
P_0	298.36	79978	17166	62812	3.65
P_{60}	321.87	86288	18720	67568	3.60
S.Em ±	1.57	-	-	-	-
C.D at 5 %	4.60	-	-	-	-
Associate crops					
Sole berseem	262.02	90188	18019	72169	4.00
Sole maize	196.51	49143	12151	36992	3.04
Berseem mixed with mustard	225.67	73126	18955	54171	2.85
Berseem + maize as intercrop at 1.5 m interval in Berseem	297.70	98472	19535	78937	4.04
Berseem + maize as intercrop at 3.0 m interval in Berseem	292.59	97321	19321	78000	4.03
Berseem + maize around the bunds of berseem	299.20	99661	19678	79983	4.06
S.Em ±	7.81	-	-	-	-
C.D at 5 %	22.93	-	-	-	-

GFY = Green fodder yield, As. = Associate, L: S = Leaf to stem, CP = Crude protein, CF = Crude fiber, BEY = Berseem equivalent yield, B: C = Benefit cost

Prevailing price of green fodder:

Berseem = 250/q, Berseem (seed) = 100/kg, Maize = 150/q, Mustard = 100/q.

The maximum total green fodder yield of berseem (250.91 q/ha) and component crop yield (136.73 q/ha) was recorded with the application of phosphorus 60 kg/ha and it was found significantly superior 8.06 and 7.42% respectively over 0 kg/ha (Table 1). An increased response to applied phosphorus was reported by Agarwal *et al.,* (2004). The L: S ratio and crude protein content linearly increased with 60 kg/ha phosphorus application but the increase was non-significant. The crude fiber percent was significantly affected by phosphorus levels in berseem and associate crops.

Highest berseem equivalent yield was obtained when, berseem and maize was fertilized with 60 kg/ha phosphorus (Table 1). Similar conclusion were drawn by Singh *et al.,* (1997-98).The gross and net returns increased by 6310 and 4756 Rs/ha with phosphorus application of 60 kg/ ha. The B: C ratio (3.65) was high with 0 kg/ha phosphorus application.

Among the associate crops, green fodder yield of maize (73.24 q/ha) was maximum when maize was intercrop at 1.5 m interval in berseem (Table 1). Between two component crops, when mustard associated with berseem as mixed crop maximum green forage yield of (126.50 q/ ha) was obtained. The increase in green forage yield of berseem with association of Mustard was also documented by Sardana and Narwal (2005). The reduction in growth and quality attributes of berseem was noticed when it was associated with maize and mustard. Berseem equivalent yield was maximum when maize was associated with berseem around check basins (Table 1). The lowest and highest B: C ratio was observed when berseem was associated with mustard as mixed crop and maize as around the bunds of check-basin.

The results demonstrated that Phosphorus application @ 60 kg/ha improved growth characters, subsequent forage yield, gross and net returns of berseem. Among the associate crops, total equivalent yield, gross and net returns of berseem were higher when it was sown with maize in different treatment combination compared to sole berseem.

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