

## PRODUCTION POTENTIAL OF BERSEEM WITH OATS CHINESE CABBAGE AND MUSTARD

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Field experiment conducted at Agronomy Farm Rajasthan College of Agriculture, Udaipur with three crop mixtures viz., berseem with oats; chinese cabbage and mustard at three different seed rates and two intervals of first cut, during rabi season of 1982-83, revealed that berseem green forage yield can be increased to the extent of 115 % by growing chinese cabbage @ 2.0 kg/ha with it, during its establishment phase. With respect to interval of first cut, highest green forage of the season was obtained by first cutting taken at 45 Days After Sowing (1551g/ha) compared to 1486 g/ha at 35 Days After Sowing. Quality components like crude protein, crude fat, crude fibre, mineral matter and phosphorus were also estimated on the basis of dry matter production.

Berseem is a prominent fodder legume in irrigated areas of Western and Northern India. It provides nutritious green forage from December to May. The crop, however takes 7 to 10 weeks to establish itself. It has only one well developed shoot per plant during its initial crop growth. As a consequence, the yield in first cutting is very low amounting to only  $\frac{1}{3}$  to  $\frac{1}{2}$  of that obtained in the second and third cutting. Therefore, if a suitable crop of relatively faster growth habit can be grown mixed with berseem, initial forage yield could then be increased. Shah (1965) reported that Mustard, oats etc. when grown mixed with berseem, increased forage production by 40-123 per cent in the first cutting grown at IARI, New Delhi.

In crops like berseem, chinese cabbage, oat etc. where maximum vegetative growth and expansion is mainly desired for higher forage production it is all the more necessary that the optimum seed ratio of the two component crops is precisely ascertained. When berseem is grown mixed with a fast growing component, it could be possible to obtain larger forage production with in a shorter interval of initial crop growth. Therefore, the need for comparing time of first cutting was considered worth exploring. With these objectives in mind a field experiment comprising various agronomic practices was planned.

### MATERIALS AND METHODS:

The present investigation was conducted during rabi 1982-83 at

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agronomy farm, Rajasthan College of Agriculture, Udaipur. The treatments for the experiment consisted of three crop mixtures with different seed rates and two dates of first cut, viz. Berseem alone; Berseem + oats (15, 25 and 35 kg/ha); Berseem + Chinese cabbage (1.0, 1.5 & 2.0 kg/ha); Berseem + Mustard (1.0; 1.5 and 2.0 kg/ha) and two times of first cutting were taken as 35 Days After Sowing; 45 Days After Sowing. A standard seed rate of berseem @ 25 kg/ha was used for all the treatments. The sowing of berseem, oats, chinese cabbage and mustard was done by broad casting in individual plots and mixed with the help of rake. The plots thus sown were flooded with irrigation water. Thus, six cuttings were taken with 17 irrigations in the entire season. The experiment was irrigated by sewage water. Criteria used for treatment evaluations were green forage yield, dry matter production and quality components like crude protein, crude fat, crude fibre, mineral matter and fodder Phosphorus computed only for first three cuttings on the basis of dry matter production. The factorial experiment was conducted in randomised blocks design with three replications. Data on these aspects were statistically analysed according to Fisher (1947) and Yates (1937).

## RESULTS AND DISCUSSION

All the companion crops increased yield of green and dry matter in the first cutting to the extent of

37.6 to 115.3% without significantly reducing the total yield of the season. In comparison to berseem alone, inclusion of mustard and chinese cabbage increased the yield of green forage by 76.0 to 104.3 and 70.1 to 115.4% respectively; while in the case of oats the increase was 38.1 to 73.5% Table (1). It may also be noted that trends in dry matter production observed in the present investigation was similar to the green forage production. For example berseem + Chinese cabbage and berseem + Mustard crop mixtures produced 22.8 to 27.9 and 25.5 to 30.0 q/ha dry matter in first cutting as against 20.8 to 27.3 q/ha observed from berseem + oat crop mixture. Chinese cabbage and mustard soon after emergence and subsequent establishment, entered in active vegetative growth, thereby resulting in profuse foliage expansion and production. The first cutting of berseem which was taken at 35 and 45 Days After Sowing coincided very well with the grand growth phase of these brassica crops. On the contrary, oats showed very poor associated growth in first cutting, as it took longer time in its establishment as compared to brassica crops. Similar results have been reported in an experiment conducted at Haryana Agriculture University (Anonymous 1973) where berseem + Japan rape gave higher yield in the first cutting than berseem + oat crop mixtures.

Table: 1. Effect of crop mixtures at varying seed rates and interval of first cut on green and drymatter production (t/ha)

Treatments	Green forage yield						Dry matter yield						
	Cuttings			Total of I to VI			Cuttings			Total of I to VI			
	I	II	III	I to III	I to VI	I	II	III	I to III	I to VI			
<b>Crop Mixtures</b>													
Ber. 25 + Oat 15	161.6	286.6	314.0	726.0	1531.0	20.8	38.2	43.6	102.75	234.2			
Ber. 25 + Oat 25	194.0	295.0	320.0	809.0	1552.0	26.0	39.7	44.4	110.15	237.0			
Ber. 25 + Oat 35	203.3	292.5	307.5	803.0	1531.0	27.3	39.4	42.8	109.05	233.8			
Ber. 25 + Ch. Cab. 1.0	199.0	240.0	293.0	732.0	1495.8	22.8	31.8	40.6	95.4	224.4			
Ber. 25 + Ch. Cab. 1.5	234.0	238.3	280.8	753.0	1516.0	25.75	31.3	38.8	95.95	226.3			
Ber. 25 + Ch. Cab. 2.0	252.0	245.0	279.0	776.0	1532.0	27.9	32.1	38.5	98.55	227.3			
Ber. 25 + Mustard 1.0	206.0	237.0	291.6	735.0	1496.0	25.5	31.0	40.5	97.15	228.1			
Ber. 25 + Mustard 1.5	225.0	231.6	285.0	742.0	1510.0	28.4	30.3	39.35	93.1	229.3			
Ber. 25 + Mustard 2.0	239.0	233.3	285.0	757.0	1528.0	30.0	30.4	39.3	99.8	231.45			
Berseem 25	117.0	277.5	316.6	711.0	1493.0	14.6	35.4	43.9	94.95	226.5			
SEM ±	13.65	10.09	7.5	16.7	20.6	1.65	1.35	1.05	2.00	3.02			
CD at 5%	39.07	28.09	21.5	47.8	NS	4.7	3.86	3.02	5.09	NS			
<b>Interval of First Cutting</b>													
35 Days After Sowing	152.0	263.0	299.5	714.0	1486.0	18.1	34.5	41.27	93.9	223.3			
45 Days After Sowing	254.0	252.0	295.0	802.0	1551.7	31.7	33.6	41.15	100.55	236.3			
SEM ±	6.1	4.5	3.35	7.45	9.24	0.74	0.6	0.47	0.92	1.35			
CD at 5%	17.45	NS	NS	21.4	26.46	2.12	NS	NS	2.64	3.86			

It may further be observed that in second and third cuttings, the trends in green forage production were quite different from those in the first cutting. By and large berseem + oat crop mixtures and berseem alone proved superior to berseem + Chinese cabbage and berseem + mustard crop mixtures. Thus, it appears that the brassica plant exerted shading, which affected the regeneration of berseem plants; whereas oats did not have much shading effect. This is evidenced by the trends in drymatter production also.

Among the different seed rates of crop mixtures, oats @ 25 kg/ha proved to be the best for total of first three cuttings, as there was minimum shading effect on berseem plants and thus optimum berseem stand for better leaf growth and expansion was achieved. Similar results have been obtained in an experiment at Udaipur University (Anonymous 1979-80 and 1980-81), where berseem 30 + oat @ 25 kg/ha produced highest green forage over the different seed rates of oats, chinese cabbage and mustard associated with berseem.

The green and dry matter production was greatly influenced by different times of first cutting. First cut taken at 45 Days After Sowing gave 67% more green forage and 75% more dry matter over 35 Days After Sowing. The low forage yield of first cut taken at 35 DAS could

be attributed to the fact that there was inadequate foliage development, which resulted in less harvestable green matter. Such observations have also been recorded by Shaaban (1975) and Liang (1980), and reported that forage yield of berseem, decreased when first cut was taken before complete shoot development.

It is interesting to note that second and third cuttings did not show variations in green and dry matter production. When the total green and dry matter production for the entire season was analysed, it was found that the first cut taken at 45 DAS was significantly superior over 35 DAS. These variations existed because of greater pronounced effect of first cutting, which could not be compensated in the subsequent cuttings due to poor shoot development in 35 Days After Sowing.

#### QUALITY :

All the companion crops significantly increased the crude protein, crude fat, crude fibre, mineral matter and Phosphorus uptake over pure berseem in first cutting (Table - 2). In total of first three cuttings, berseem + Oat crop mixtures produced the highest crude protein, which was on an average 12.9, 10.8 and 11.9 % higher than the averages of berseem + chinese cabbage, berseem + Mustard and berseem alone. It was due to the fact that oat plants have higher dry matter % and also oat plants at young stage have as much crude protein as in the legume plants

Table: 2. Effect of crop mixtures at varying seed rates and interval of first cut on the uptake of quality components (q/ha)

Treatments	CUTTINGS									
	Crude Protein		Crude Fibre		Crude Fat		Mineral Matter		Phosphorus	
	I	Total of I to III	I	Total of I to III	I	Total of I to III	I	Total of I to III	I	Total of I to III
<b>Crop Mixtures</b>										
Ber. 25 + Oat 15	3.65	18.325	3.95	20.115	0.61	2.91	2.85	13.805	0.067	0.31
Ber. 25 + Oat 25	4.61	19.775	4.96	21.744	0.81	3.188	3.51	14.74	0.075	0.328
Ber. 25 + Oat 35	4.71	19.49	5.22	21.745	0.86	3.206	3.66	14.565	0.078	0.323
Ber. 25 + Ch. Cab.	1.0	3.97	3.79	17.98	0.57	2.505	3.22	12.66	0.09	0.305
Ber. 25 + Ch. Cab.	1.5	4.5	4.21	17.765	0.64	2.5	3.63	12.77	0.102	0.314
Ber. 25 + Ch. Cab.	2.0	4.89	4.51	18.065	0.69	2.649	3.95	13.13	0.11	0.322
Ber. 25 + Mustard	1.0	4.49	4.32	18.245	0.71	2.615	3.59	12.935	0.102	0.318
Ber. 25 + Mustard	1.5	4.92	7.74	18.255	0.83	2.733	4.01	13.09	0.113	0.319
Ber. 25 + Mustard	2.0	5.28	4.9	18.319	0.86	2.751	4.27	13.385	0.119	0.329
Berseem 25	2.66	17.15	2.68	18.532	0.36	2.555	2.16	13.01	0.063	0.307
SEM $\pm$	0.29	0.4	0.27	0.4	0.048	0.063	0.23	0.291	0.006	0.0072
CD at 5%	0.83	1.145	0.79	1.155	0.13	0.181	0.66	0.83	0.017	0.0209
<b>Interval of First Cutting</b>										
35 Days After Sowing	3.18	10.661	3.13	17.903	0.49	2.561	2.53	12.460	0.0664	0.2948
45 Days After Sowing	5.55	18.885	5.53	20.25	0.89	2.9635	4.44	14.357	0.1182	0.341
SEM $\pm$	0.13	0.179	0.12	0.18	0.0217	0.0282	0.1	0.13	0.0027	0.00316
CD at 5%	0.37	0.51	0.35	0.515	0.062	0.081	0.29	0.373	0.0078	0.00906

(Narang, 1960). The crude fiber produced by berseem + oat crop mixtures was on an averages 18.2, 16.04 and 14.03 % higher than that produced by berseem + Chinese cabbage, berseem + Mustard and pure berseem.

The crude fat and mineral matter produced by berseem + oat crop mixtures were 21.5, 14.7, 21.37 and 11.8, 9.4, 10.45% higher than that of berseem + chinese cabbage, berseem + mustard and pure berseem. This is evidenced by the work of Mayer and Anderson (1952), they reported that in mixed sown crop of berseem + oats, due to more availability of nitrogen a greater number of oat cells may become meristematic which have tendency to absorb more mineral salts. In the presence of these cells the process of respiration is also accelerated, hence there are chances to get more carbohydrates converted into fat.

In case of time of first cutting the crude protein, crude fibre, crude fat, mineral matter and phosphorus uptake under first cut taken at 45 Days After Sowing were significantly higher than that under 35 Days After Sowing.

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