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# Fodder yield and quality of lucerne (*Medicago sativa*) grown as pure stands and in mixture with oats (*Avena sativa*), mustard (*Brassica campestris*) and ryegrass (*Lolium perenne*) under different cutting managements

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## Introduction

Legume-cereal mixtures are important protein and carbohydrate sources for livestock and provide a balanced chemical composition for livestock feeding along with higher green forage yields than the pure stands (Berdahl *et al.* 2001; Albayrak and Ekiz, 2005). Lucerne is the most important *rabi* legume crop of Punjab grown under limited irrigation conditions and provides succulent, palatable and nutritious fodder to dairy animals. The fodder yield of first cut of lucerne is very low so it is usually grown in mixture with oats and or mustard. The information on the mixtures of lucerne and suitable cutting times is scant. This study was conducted to assess fodder yield and quality of lucerne mixtures with ryegrass, oat and mustard along with the effects of cutting time.

## Materials and methods

The field experiment was conducted at Guru Angad Dev Veterinary & Animal Sciences University, Ludhiana, Punjab, India (30°56'N, 75°52'E, 247 m above sea level). Mean annual rainfall of 705 mm was received during the winter seasons of 2009-10 and 2010-11. The soil of the experimental site was a sandy loam, pH 7.4 and low available N, P and medium levels of available K. The experiment consisted of twelve treatments having combinations of four mixtures (lucerne pure, lucerne + oats, lucerne + mustard and lucerne + ryegrass) and three cutting management strategies (first cut at 55, 65 and 75 days after sowing) were conducted in a factorial randomized block design with four replications. The fertilizer recommended for lucerne (25 kg N and 80 kg P<sub>2</sub>O<sub>5</sub>/ha) was applied at the time of sowing. Lucerne was sown by broadcasting on 15 October in both years at 20 kg/ha. The seed rates of oats, mustard and ryegrass were 37.5, 1.88 and 5 kg/ha, respectively. Six cuttings during each year were taken during the crop cycle.

## Results and discussion

The green fodder yield of all the mixtures was significantly higher than pure lucerne and the recorded increases were between 9.6 to 14.0 % (Table 1). Similar

increases were also observed in dry matter yield. Among the mixtures, lucerne + ryegrass recorded highest green fodder and dry matter yield (138.3 and 17.0 t/ha) followed by lucerne + oats (134.0 and 16.3 t/ha) and lucerne + mustard (132.0 and 16.2 t/ha) mixtures and were found to be significantly better than lucerne pure (120.0 and 14.7 t/ha), however, the differences between mixtures were non-significant. These results are supported by other findings where the increase in green fodder yield in mixtures was greater than grass or legume monocultures which were thought to be due in part to better utilization of light and symbiotically fixed nitrogen (Berdahl *et al.* 2001; Albayrak and Ekiz 2005). Mustard contributed in the first cut only, oats contributed in two cuttings, whereas, ryegrass contributed in the cuttings up to mid-April. The average crude protein content of first two cuts (%) was highest in pure lucerne (19.9%) followed by lucerne + rye grass (19.2%) and further decreased in the other two mixtures. The first cut at 65 days after sowing gave significantly higher total green fodder and dry matter yield (138.0 and

**Table 1. Effect of mixtures and cutting managements on green fodder and dry matter yield of lucerne (data averaged over two years)**

Treatment	Green fodder yield (t/ha)	Dry matter yield (t/ha)	Crude protein (%)
Mixtures			
Lucerne pure	120.0	14.7	19.9
Lucerne + oat	134.0	16.3	18.5
Lucerne + mustard	132.0	16.2	17.5
Lucerne + rye grass	138.3	17.0	19.2
LSD (p=0.05)	9.0	1.1	1.2
Cutting management			
1 <sup>st</sup> cut at 55 DAS	124.8	14.9	19.7
1 <sup>st</sup> cut at 65 DAS	138.0	16.7	19.1
1 <sup>st</sup> cut at 75 DAS	130.2	16.4	17.5
LSD (p=0.05)	7.9	1.0	1.0

16.7 t/ha) over the first cut at 55 days after sowing (124.8 and 14.9 t/ha). Delayed first cut from 65 to 75 days after sowing, further reduced matter yield (130.2 and 14.9 t/ha) although the differences were non-significant (Table 1).

Chen *et al.* (2012) also recorded significant reduction in green fodder yield reductions of lucerne when it was cut earlier (30 days) compared to late (40 and 60 days) due to reductions in amount of energy captured for photosynthesis. The first cut at 55 days recorded the highest crude protein (%) and was found to be similar to the first cut at 65 days after sowing, however further delay in first cut i.e. at 75 days after sowing significantly reduced the crude protein content (Table 1). The crude protein yield of the first cut at 65 days after sowing was highest recorded.

### Conclusion

It may be concluded that the addition of oats (37.5 kg/ha),

mustard (1.88 kg/ha) or ryegrass (5 kg/ha) with full seed rate of lucerne (20 kg/ha) produced higher quantity of good quality fodder with the first cut at 65 days after sowing. Lucerne + rye grass combination recorded higher crude protein content (%) than other mixtures.

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