

PERFORMANCE OF RANGE FORAGE SPECIES IN SUBTROPICAL HUMID ZONE AT JABA UNDER BARANI CONDITIONS

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Summary

Four ecotypes of *Medicago sativa* two ecotypes of *Festuca elatior* Var *arundinacea* and one ecotype of *Phalaris tuberosa* were sown at Jaba in November 1977 under barani conditions in a randomised complete block design replicated six times. In October, 1978, *Festuca elatior* (Kenwell) yielded significantly more air-dried forage (2139 kg/ha) while in May, 1979 *Medicago sativa* (Viuta) produced significantly more air-dried forage (1516 kg/ha) as compared with other forage species.

The two ecotypes of *Festuca elatior* did not show any significant difference in the air-dried forage production between themselves. *Phalaris tuberosa* produced less air-dried forage in both the harvesting seasons. None of the ecotypes/species showed any significant difference in the number of established plants among themselves except *Festuca elatior* (Kenwell) which had significantly more number of established plants as compared with other ecotypes/species.

Introduction

Jaba, where the study was conducted is situated at an elevation of 1122 metres above mean sea level. Average annual rainfall is 1500 mm, the bulk of which is received during summer monsoon. Snow-fall is common in winter. The mean annual minimum and maximum temperature varies from 1 to 23 °C in Winter and 14 to 35 °C in Summer. Average relative humidity is 48 and 33 in June to about 81 and 69 in August at 0800 and 1700 hours respectively. Terrain of the tract being hilly determines the land use. The soil is loam in texture and deficient in nitrogen, pH of the soil is 7.5. The average composition of soil samples collected from the area and analysed at Soil Survey of Pakistan, Lahore is given below:

Soil element	Quantity
Sand U.S.	50%
Clay U.S.	10%
Silt U.S.	40%
Organic matter	1.82%
Texture	Loam
CaCO ₃	2.00%
CEC Meg/100 gm	17.6
ECex 10 ³	0.48
pH.	7.5
HCO ₃ Soluble ions meg/1	2.0
Cl.	1.4
SO ₄	1.4
Ca+Mg	2.4
Na	2.8

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The indigenous vegetation dries up in winter and the area faces acute shortage of green forage/Fodder. According to the prevailing practice no crop is grown under the apple trees in apple orchards. Keeping in view this shortage the following grasses and legumes were sown at Jaba in apple orchard to assess their performance under barani conditions after seed multiplication in Range Research Nursery at Pakistan Forest Institute, Peshawar.

R.M.No.	Species	Source
470	<i>Festuca elatior</i> Var-arundinacea	Kentucky
471	<i>Festuca elatior</i> Var-arundinacea	Kenwell
205	<i>Medicago sativa</i>	Viuta FAO Lot No. 12.982.
206	<i>Medicago sativa</i>	Williams-burg. FAO Lot No. 13.
131	<i>Medicago sativa</i>	F.A.O. Lot No. 14.032.
151	<i>Medicago sativa</i>	New Mexico.
222	<i>Phalaris tuberosa</i>	F.A.O.

Method

Four ecotypes of *Medicago sativa*, two ecotypes of *Festuca elatior* Var *arundinacea* and *Phalaris tuberosa* were sown in the first week of November, 1977 in apple orchard having about 50% canopy cover. The experimental design used was randomised complete block design with six replications. Sowing was done in 5x4m² well prepared plots in lines. Line to line distance was kept 50 cm leaving 50 cm border between the plots. Seed was sown at 2 cm depth. Twenty grams seed was sown in each plot using seed rate of 10 kg/ha. One weeding was done after seed germination. Data for average height, average number of plants and average green forage production were collected in the 2nd. week of November, 1978 and 1st week of May, 1979. Airdried weight of clipped forage was recorded after 10 days of clipping during both the seasons. The average airdried forage production in kg/ha was calculated for each forage species/ecotypes.

Analysis of variance was carried out to determine whether means of air-dried forage and number of established plants significantly differed between species/ecotypes. Least significant difference was applied to evaluate the difference of means.

Forage samples of each species were analysed at Chemistry Branch of Pakistan Forest Institute, Peshawar for the determination of various feed components (nutrients) necessary for the livestock.

Results and Discussions

All the forage species were in flowering/fruiting stage in October, 1978. The ecotypes of *Medicago sativa* were in flowering/fruiting stage in May 1979 while the grasses were in vegetative growth stage at that time. All the forage species were flush green. The average height of the

species are given below:

R.M. No.	Species	Average height (cm)	
		October, 78	May, 1979
470	<i>Festuca elatior</i>	94	79
471	<i>Festuca elatior</i>	91	80
131	<i>Medicago sativa</i>	68	80
205	<i>Medicago sativa</i>	74	78
206	<i>Medicago sativa</i>	74	68
351	<i>Medicago sativa</i>	74	84
222	<i>Phalaris tuberosa</i>	80	67

There was no significant difference of height in both the clipping seasons among the forage species under trial.

Forage Production: *Festuca elatior* (Kenwell) produced significantly more airdried forage (2139 kg/ha) in October, 1978 as compared with other forage species. In May, 1979 the airdried forage production of *Medicago sativa* (Viuta) was significantly more (1516 kg/ha) than those of all other forage species. *Phalaris tuberosa* produced less airdried forage in both the clipping seasons. Average airdried forage production for all the forage species/ecotypes is given below:

Airdried forage production in kg/ha

R.M. No.	Species	Mean*	
		October, 1978	May, 1979
471	<i>Festuca elatior</i>	2139 a	916 a
470	<i>Festuca elatior</i>	1802 a	866 a
351	<i>Medicago sativa</i>	1145 b	1291 b
206	<i>Medicago sativa</i>	918 c	1250 b
205	<i>Medicago sativa</i>	752 c	1516 b
131	<i>Medicago sativa</i>	661 c	1183 b
222	<i>Phalaris tuberosa</i>	162 d	553 c

*Means followed by the same letter are not significantly different from each other at 0.5% significant level.

None of the ecotypes of *Medicago sativa* showed any significant difference in the airdried forage production in both the clipping seasons. There was no significant difference in the airdried forage production between the two ecotypes of *Festuca elatior* in both the clipping seasons. The data also indicate that the peak production period for ecotypes of *Medicago sativa* is after spring while the peak production period for the grasses is after summer monsoon. The forage yield of two ecotypes of *F. elatior* decreased in May, 1979 while the forage yield of four ecotypes of *Medicago sativa* increased. In the first year the forage yield of all the ecotypes of *Medicago sativa* was less as compared with the forage yield of ecotypes of *F. elatior*.

Establishment

The number of plants for each forage species was counted in each plot in May, 1979. *Festuca elatior* (Kenwell) had significantly more (794) number of established plants as compared with other forage species. None of other forage species, showed any significant difference in the number of established plants between themselves as shown by the following figures.

Number of plants in 5 x 4 m² plot

R.M. No .	Species/Ecotypes	Mean
470	<i>Festuca elatior</i>	661
471	<i>Festuca elatior</i>	794*
351	<i>Medicago sativa</i>	658
206	<i>Medicago sativa</i>	646
131	<i>Medicago sativa</i>	627
205	<i>Medicago sativa</i>	610
222	<i>Phalaris tuberosa</i>	505

* Significant at 5% level.

Although the number of established plants in case of *Festuca elatior* (Kenwell) was significantly more (794) but the airdried forage production was less than *Medicago sativa* (Viuta). This shows that it is not only the number of established plants but also the vigour of the established plants which contributes toward the forage production.

Chemical analysis

The chemical analysis of forage samples as carried out by the Chemistry Branch of Pakis-

tan Forest Institute, Peshawar is given below:

Chemical analysis of forage samples

R.M. No.	Species	Carbohy drats %	Protein %	Fibre %	Fate %	Ash %	Moisture %
470	<i>Festuca elatior</i>	24.5	12.7	36.7	2.8	14.5	8.8
471	<i>Festuca elatior</i>	32.7	10.0	34.1	2.8	13.8	7.1
131	<i>Medicago sativa</i>	30.8	15.5	33.1	2.4	9.5	8.7
205	<i>Medicago sativa</i>	31.7	14.6	32.3	2.4	10.7	8.3
206	<i>Medicago sativa</i>	27.2	16.4	35.3	2.4	10.7	8.0
351	<i>Medicago sativa</i>	25.9	15.5	35.8	2.7	11.9	8.2
222	<i>Phalaris tuberosa</i>	23.6	13.7	34.0	3.5	16.7	8.5

There were more carbohydrates in *Festuca elatior* (R.M No. 471) 32.7%, followed by *Medicago sativa* (205) 31.7%, *Medicago sativa* (131) 30.8%, *Medicago sativa* (206) 27.2%, *Medicago sativa* (351) 25.9%, *Festuca elatior* (470) 24.5% while the carbohydrate in *Phalaris tuberosa* were less 23.6% only. *Medicago sativa* (206) had highest protein content of 16.4% followed by *Medicago sativa* (131 & 351) 15.5% *Medicago sativa* (205) 14.6%, *Phalaris tuberosa* (222) 13.7%, *Festuca elatior* (470) 10%. Fibre contents were in the order of *Festuca elatior* (470) 36.7%, *Medicago sativa* (351) 35.8%, *Medicago sativa* (206) 35.3%, *Festuca elatior* (471) 34.1% *Phalaris tuberosa* (222) 34%, *Medicago sativa* (131) 33.1% and *Medicago sativa* (205) 32.3% Fat contents were highest in *Phalaris tuberosa* (222) 3.5%, followed by *Festuca elatior* (470 & 471) 2.8%, *Medicago sativa* (351) 2.7% and *Medicago sativa* (131, 205 & 206) 2.4% respectively.

Conclusion

The results of the experiment indicate that *Medicago sativa* and *Festuca elatior* can successfully be raised/sown under the partial shade of apple orchards to enhance the forage production in the sub-tropical humid ecological zone. These species can successfully be used in reseeded operations in sub-tropical humid zone under barani conditions.

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