

PERFORMANCE OF EXOTIC CLOVERS IN SUBTROPICAL HUMID ZONE AT JABA UNDER BARANI CONDITIONS

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Abstract:

Three exotic clovers (*Trifolium* species) were sown in November, 1978 under barani conditions at Jaba. *Trifolium hybridum* produced maximum air-dried forage in April, 1979. *Trifolium hybridum* and *Trifolium incarnatum* produced significantly more airdried forage (2200 kg/ha and 2160 kg/ha) as compared with *Trifolium pratense*, (1007 kg/ha). There was no significant difference in forage production between *Trifolium hybridum* and *Trifolium incarnatum*. None of clovers showed any significant difference in the number of established plants.

Introduction:

The study was conducted at Jaba situated at 1122 metre elevation. Average annual rainfall is 1500 mm the bulk of which is received during summer monsoon. Snowfall is common in winter. The mean annual maximum and minimum temperature varies from 14 to 35 °C in summer and 1–23 °C in winter. Average relative humidity is 48 and 33 in June to about 81 & 69 in August at 0800 and 1700 hours respectively. Topography of the tract is mountainous and determines the land use. The soil is silt loam in texture and deficient in nitrogen, pH of the soil is 7.7. Soil samples were collected and analysed at Soil Survey of Pakistan, Lahore.

The average composition of soil samples is given as under:

Soil element	Quantity
Sand US	15%
Clay US	19%
Silt US	66%
Organic matter	2.68%
Texture	Silt loam
CaCO ₃	11%
CEC msg/100 gms	20.8
ECe x 10 ³	1.1
PH	7.7
Soluble ions meg/1	
HCO ₃	2.4
Cl	4.8
So ₄	3.8
Ca+Mg	6.4
Na	4.8

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The indigenous vegetation dries up in winter and there is a shortage of green forage in the area. To overcome this shortage three exotic *Trifolium* species 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. According to the prevalent practice no crop is grown under the apple trees in apple orchards. Though the effect of growing clovers in apple orchards on the vigour of apple trees and fruit production was not evaluated in this study, it is expected that nitrogen fixed by clovers will improve the vigour of apple trees and increase the fruit production also.

Method:

Three exotic clovers namely *Trifolium hybridum*, (Australia), *Trifolium incarnatum* (Jalladega F.A.O. No. 13.602) and *Trifolium pratense* (Chesapeake F.A.O. No. 13.318) were sown in the first week of November, 1978 in apple orchard having about 50% tree cover. The experimental design used was randomised complete block design with eleven replications. Sowing was done in 4x3 m² well prepared plots in lines spaced at 50 cm leaving 50 cm border between the plots. Seed was sown at a depth of 1.5 cm. Twelve gram seed was sown in each plot using the seed rate of 10 kg/ha. Data for average height, average number of plants and average green forage production were collected in the last week of April 1979. Airdried weight of clipped forage was recorded in the 2nd week of May 1979. The average airdried forage production in kg/ha was calculated for each species.

Analysis of variance was carried out to determine whether means of airdried forage and number of established plants were significantly different from each other. 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, for the determination of various feed components (nutrients) necessary for the livestock.

Results and Discussions:

Trifolium hybridum and *Trifolium incarnatum* were in flowering/fruiting stage while *Trifolium pratense* was in vegetative stage at the time of final observations. The average height of *Trifolium incarnatum*, *Trifolium pratense* and *Trifolium hybridum* was 56, 43 and 41 cm. respectively. All the three species were flush green.

Forage Production:

Trifolium hybridum and *Trifolium incarnatum* produced significantly more airdried forage as compared with *Trifolium pratense*. *Trifolium hybridum* and *Trifolium incarnatum* did not show any significant difference in the airdried forage production between themselves as indicated by the following figures.

Airdried forage in kg/ha

R.M.No.	Species	Mean *
456	<i>Trifolium hybridum</i>	2200 a
185	<i>Trifolium incarnatum</i>	2160 a
187	<i>Trifolium pratense</i>	1007 b

*Means followed by the same letter are not significantly different from each other at 5% significant level.

Establishment:

The number of plants for each species was counted in each plot. None of the species showed any significant difference in the number of plants established as indicated by the following figures:

Number of plants in 4x3 m² plot.

R.M. No.	Species	Mean
456	<i>Trifolium hybridum</i>	269 N.S.
185	<i>Trifolium incarnatum</i>	278 N.S.
187	<i>Trifolium pratense</i>	299 N.S.

This also indicates that it is not only the number of established plants but the vigour of the established plants which contributes towards the forage production.

Chemical analysis:

The chemical analysis of forage samples as carried out by the Chemistry Branch of Pakistan Forest Institute is given as follows:

Chemical analysis of forage samples

Species	Carbo hydrates %	Protein %	Fibres %	Fats %	Ash %	Moisture %
<i>Trifolium hybridum</i>	22.7	11.8	42.6	1.9	11.5	9.5
<i>Trifolium incarnatum</i>	38.9	13.7	22.0	2.2	14.4	8.8
<i>Trifolium pratense</i>	21.8	17.3	38.0	2.9	10.3	9.7

There were more carbohydrates in *Trifolium incarnatum* 38.9%, less in *Trifolium hybridum* 22.7% and least in *Trifolium pratense* 21.8%. *Trifolium pratense* had highest protein content

of 17%, followed by *Trifolium incarnatum* 13.8% and *Trifolium hybridum* 11.8%. Fibre contents were in the order of *Trifolium hybridum* 42.6%, *Trifolium pratense* 38% and *Trifolium incarnatum* 22%. Fat contents were highest in *Trifolium pratense* 2.9%, less in *Trifolium incarnatum* 2.2% and least in *Trifolium hybridum* 1.9%.

Conclusion:

The results of the study show that *Trifolium hybridum*, *Trifolium incarnatum* and *Trifolium pratense* can successfully be raised/sown under the partial shade of apple orchards to enhance the forage production in winter season in the subtropical humid ecological zone.

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Chemical analysis of forage samples

Species	Crude hydrolysis %	Protein %	Fibre %	Fat %	Moisture %
<i>Trifolium hybridum</i>	22.7	11.8	42.6	1.9	9.2
<i>Trifolium incarnatum</i>	38.9	13.5	32.0	2.2	8.8
<i>Trifolium pratense</i>	21.8	17.2	38.0	2.9	9.1