

ECOLOGICAL CHANGES IN THE ALPINE PASTURE VEGETATION AT PAYA (KAGHAN) DUE TO COMPLETE PROTECTION FROM GRAZING

by

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Summary. Two exclosures of 0.5 hectares each, one on flat land and the other on 50 degree slope, western exposure, were established in alpine grazing lands at Paya (Kaghan) during 1969 and 1971 respectively. The effect of closure was studied during September, 1976, seven and five years respectively after their establishment. Due to closure the forage production increased about three fold. The increase was due both to increase in grass and forbs. No appreciable difference was found in the frequency of grasses or forbs of desirable, intermediate or undesirable species due to closure.

Objective. The objective of this investigation was to find out the effect of closure on range vegetation in the Himalayan moist temperate alpine zone (elevation 3100 m).

Study area. The area is situated at Paya about 9 km south of Shogran (Kaghan) in alpine ecological zone. The altitude is 3100 metres. The vegetation consists of the following main species.

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|---------|---|
| Shrubs | <i>Salix</i> spp., <i>Berberis</i> spp., <i>Juniperus communis</i> , <i>Rhododendron</i> spp., <i>Rosa</i> spp. |
| Grasses | <i>Phleum alpinum</i> , <i>Agrostis</i> spp., <i>Festuca ovina</i> , <i>Trisetum spicatum</i> , <i>Poa pratensis</i> , <i>Poa alpina</i> , <i>Poa annua</i> , <i>Carex</i> spp., <i>Agropyron dentatum</i> , <i>Agropyron caninum</i> . |
| Forbs | <i>Polygonum affine</i> , <i>Polygonum alpinum</i> , <i>Polygonum</i> sp., <i>Potentilla</i> spp., <i>Taraxicum officinalis</i> , <i>Astragalus</i> spp., <i>Thymus serpyllum</i> , <i>Geranium nepalensis</i> , <i>Plantago ovata</i> , <i>Plantago major</i> , <i>Plantago lanceolata</i> , <i>Saxifraga</i> spp., <i>Galium</i> spp., <i>Trifolium repens</i> , <i>Vicia cornifolium</i> . |

Procedures. Two exclosures of 0.5 hectares each were established one in the flat (1969) and the other on a slope (1971) at Paya. The area inside each exclosure was traversed by four permanent line transects; two in north-south direction and two in east-west. To study forage production Hussain's method** was used. On each transect 10 circular plots of 1 m² size each were systematically selected at 3 m interval throughout its length. A similar area of about the same size was selected just outside each exclosure and permanent line transects were laid out as for the exclosures. All the palatable grass and

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** Hussain, Ijaz 1968. Determination of forage production. Bulletin, Pakistan Forest Institute, Peshawar. 10 pp.

forb species within south eastern one fourth part of each quadrat both inside and outside exclosures were clipped in September 1976, one cm above ground level with hand shears. The unpalatable species were not clipped. The clipped material was air dried, weighed in grams and converted into kg/hectare by multiplying the air dried weight with 10.

To study aerial cover and frequency twenty 60 x 25 cm rectangular plots were systematically laid out on each line transect at a regular interval of 1.5 m in September 1976, throughout its length both inside and outside the exclosure. The aerial cover (total, species-wise and cumulative) of each species was recorded in each of the quadrats. The frequency of each species, total grasses and total forbs was worked out. The frequency of desirable, intermediate and undesirable species was also determined.

Results. Effect of closure on total forage production: The average total production is 10066 and 8643 kg/ha in the areas closed to grazing for 7 and 5 growing seasons respectively as compared to 3434 and 3670 kg/ha respectively in the open:

	Inside		Outside	
	Range	Average	Range	Average
		kg/ha		
Closed for 7 seasons	4153—14742	10066**	977—5735	3434
Closed for 5 seasons	3662—14193	8643*	844—6914	3670

* Significant at 0.05 level

** Significant at 0.01 level

Effect of closure on forage production of grasses and forbs: The forage production of grasses and forbs in the two exclosures is as follows:

	Grasses		Forbs	
	Inside	Outside	Inside	Outside
			kg/ha	
Closed for 7 seasons	3056*	1262	7010*	2172
Closed for 5 seasons	1204	1659	7439**	2011

The increase in forage production in the first exclosure (established in 1969) was due both to increase in grasses and forbs and in the second (established in 1971) due to forbs alone.

Effect of closure on aerial cover: The effect of seven year closure on the percentage aerial cover (total, grasses and forbs) is brought out as below:

		% cover	
		Inside	Outside
7 years closure	Grasses	22*	12
	Forbs	87	63
	Total	109	75
5 years closure	Grasses	11	16
	Forbs	81	60
	Total	92	76

Thus the % aerial cover for grasses has significantly increased in the first exclosure. There is no significant difference in the percentage aerial cover of forbs in this exclosure and of forbs and grasses in the second exclosure.

The effect of closure on the percentage aerial cover of desirable, intermediate and undesirable forage species is given below:

		% cover	
		Inside	Outside
Closed for 7 years	Desirable	85*	47
	Intermediate	15	23
	Undesirable	8	5
	Total	108*	75
Closed for 5 years	Desirable	72	50
	Intermediate	9	3
	Undesirable	10	21*
	Total	91	74

In the first exclosure total % cover increased significantly. This increase was mainly due to desirable species. There was no significant difference in the percentage aerial cover of intermediate and undesirable species in the first exclosure and desirable and intermediate species in the second exclosure. The undesirable species in the second exclosure however significantly decreased on protection.

Conclusion. The total forage production increases after protection in the alpine zone. This increase is caused by increase in the forage production of grasses as well as forbs. The frequency of grasses and forbs, and desirable, intermediate and undesirable species is not affected appreciably due to closure. The total aerial cover increases on protection due to increase in the aerial cover of grasses. The aerial cover of desirable species increases and that of undesirable species decreases after closure.

Cover		Closed for 1 year	
Desirable	Intermediate	Desirable	Intermediate
22*	12	22*	12
3	8	3	8
Total		Total	
25	20	25	20
Closed for 2 years		Closed for 2 years	
Desirable	Intermediate	Desirable	Intermediate
22*	12	22*	12
3	8	3	8
Total		Total	
25	20	25	20