Potential of winter cereals and legumes as fodder crops in the uplands of Balochistan

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Potential of winter cereals and legumes as fodder crops in the uplands of Balochistan

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SUMMARY - A number of high yielding cereal and legume fodder crops were tested for the last five years to replace low yielding local cultivars of these crops in the semi-arid continental Mediterranean climate of Balochistan. Oats produced 38% and 44% more dry matter yield than barley and wheat respectively. Among 8 cultivars of oats, Scott and PD2-LV65 produced highest dry matter yield. The best performance of these cultivars was achieved when sown from 1st to 3rd week of November at a fertilizer dose of 150-75 NP kg ha^{1}. Under irrigated conditions, among 8 varieties of lucerne, Type 8/9 produced highest fodder yield. It is concluded that oats cvs. PD2-LV65, S-81 and lucerne cv. Type 8/9 should be further disseminated among farmers for boosting-up fodder production in the uplands of Balochistan.

Key words: Agronomic, fodder yield, Mediterranean.

RESUME *- "Potentialités des céréales d'hiver et des légumineuses fourragères dans les hautes régions du Baloutchistan". Dans les régions semi-arides méditerranéennes continentales du Baluchistan, beaucoup de céréales et de fourrages légumineux à haut rendement ont été testés pendant les cinq dernières années pour remplacer des cultures locales à bas rendement. L'avoine produit 38% et 44% plus de matière sèche que le blé. Parmi les 8 cultivars testés, les avoines Scott et PD2-LV65 produisent le plus. Les meilleurs résultats ont été obtenus en semant entre la première et la troisième semaine de Novembre et en fertilisant avec 150-75 NP kg* ha^{-1}*. Sous irrigation, parmi 8 variétés de luzerne, le type 8/9 produit le rendement de fourrages le plus élevé. En résumé, on peut dire que les avoines cvs. PD2-LV65, S-81 et la luzerne cv. Type 8/9 peuvent être distribuées aux paysans pour augmenter la production de fourrages dans les hautes régions du Baluchistan.*

Mots-clés *: Agronomiques, rendement fourrager, Méditerranée.*

Introduction

Pakistan is an agricultural country situated between longitudes 60°-76° E and latitude 24°-37° N, with 131.63 million population living in an area of 834,000 km^2 (Government of Pakistan, 1996). Balochistan, the largest province by size (347,190 km^2) is situated in the arid belt between 25°N and 32°N, with an arid or semi-arid climate. Rafiq (1976) divided Balochistan into two major ecological zones (Fig. 1): the southern parts up to 30°N as hot sub-tropical desert, with 50-150 mm rainfall and the northern part (altitude 1000-3000 m) above 30°N as continental semi-arid Mediterranean, where rainfall varies from 200 to 350 mm and the principal land use is rangeland, irrigated and dry land cropping.

Sheep and goats are major income-earning resources for most farmers in highland Balochistan. But due to rapid increasing livestock population and consequent overgrazing of palatable rangeland species, an increasing feed deficit exists in this area. This feed deficit, being severe in Balochistan in terms of Total Digestible Nutrients (TDN) is 38% and Digestible Crude Protein (DCP) is 54% (Archer, 1994). These ranges need to be supplemented with increased fodder production to sustain livestock based farming system.

Materials and methods

The following experiments were conducted at Agricultural Research Institute, Sariab, Quetta (1673 m) during 1993-94 to 1996-97. The average minimum temperature during this period recorded was 0.8°C in January and maximum 29.4°C in May. Total annual winter precipitation (from October to May) mean

of two years was 202.5 mm. Production technology trials were conducted on winter cereals including oats, wheat and barley, winter legumes as lucerne and vetches. The trials, such as comparative study on fodder yield, sowing date and fertilizer trials and effect of nitrogen fertilizer on fodder yield of oats and vetch grown at various sowing mixtures, were conducted. Oats, barley and wheat were harvested for dry matter estimation at 50% flowering stage while lucerne at initiation of flowering stage and Vicia species at pod formation stage. The harvested forage was sun-dried and the dry matter yield for different treatments was determined and has been reported in this paper.

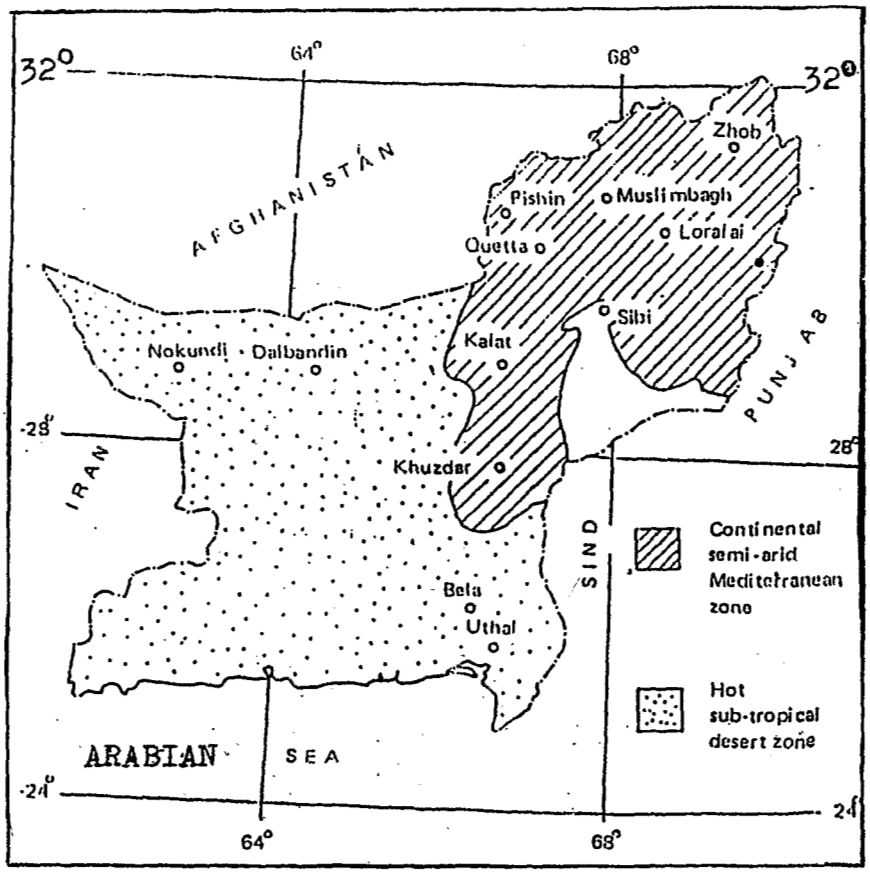

Fig. 1. Ecological zones of Balochistan (Rafiq, 1976).

Results and discussion

Performance of oats compared to traditional cereal fodder crops

Generally, the farmers of high altitude Balochistan are accustomed to grow wheat or barley for fodder production. An increase of 38% and 44% was observed in dry matter yield of oats than barley and wheat respectively by using high yielding variety technology (Table 1). Oats is the highly suited crop because of its multifarious benefits and properties, i.e. it requires minimum rainfall from 200-400 mm as a fodder crop and has wider ecological adaptability from light to severe cold climatic conditions and is acceptable to all animals as a feed.

Early and late varieties prolong the availability of fodder supplies and being multi-cut, cover fodder deficit periods during winter (Hussain *et al.*, 1994). The fodder yield potential of oats is at least two times more than the existing cultivars of wheat and barley. By the introduction of high yielding cultivars of oats in the uplands of Balochistan, the wheat crop which was traditionally being used for fodder, has been

completely replaced by oats, thus saving the valuable chunk of land which could be used for raising wheat grain crop or some other cash crop.

Table 1. Dry matter yield (t ha^{-1}) of different oats, barley and wheat cultivars

Cultivars	Dry matter yield		Mean
	1994-95	1995-96	
Oats			
PD2-LV65	10.90	11.25	11.07
S-81	11.70	11.50	11.60
Barley			
Hurmol-94	10.10	8.70	9.50
R. Masrooka	7.10	6.80	6.95
Mean	8.60	7.75	
Wheat			
Sariab-92	8.60	8.80	8.70
Local white	6.70	7.30	7.00
Mean	7.65	8.05	

Evaluation of various oats cultivars

To determine the best cultivar of oats for semiarid Mediterranean climate of Balochistan, eight cultivars were sown under similar conditions for two years and the results based on mean of two years, indicated that cultivar Scott gave highest (9.7 t ha^{-1}) dry matter yield, followed by OA-330-60 (9.2); Cuscade (8.95), PD2-LV65 (8.85), Tibor (7.9), Swan (7.55), Superlate (7.4) and Jasper (6.9) t ha^{-1}. It is suggested that evaluation of different oats varieties in this area should be continued.

Optimum planting date

To determine the best sowing dates for oats in this area, two cultivars of oats, Scott and S-81, were planted with an interval of 15 days, from 20.9.95 to 5.12.95. It was found that oat cultivars sown in the third week of November produced maximum fodder yield, followed by an early date of sowing, i.e. first week of November. It is therefore suggested that for obtaining maximum fodder yield the crop should be planted from the first week to the third week of November.

Fertilizer requirements of oats

Oats cultivars PD2-LV65 and Scott produced maximum dry matter yields with the application of fertilizer dose of 150-75 kg NP ha^{-1} (Table 2). This increase in dry matter yield over control was 72% and 57% in the case of PD2-LV65 and Scott, respectively. The data further shows that PD2-LV65 was more responsive to fertilizer treatments than Scott.

Varietal evaluation of fodder legumes

Lucerne is extensively grown around big cities for feeding the animals (Anees and Hassan, 1996). Keeping in view the low performance of local cultivars of lucerne, a number of promising varieties were introduced to find out the high yielding cultivars suitable for the area. The results indicated that lucerne cultivar Type 8/9 produced maximum dry matter yield (8.77 t ha^{-1}), followed by Sundor (8.03), AO52

(7.83), AO42 (7.5), AO44 and AO46 (7.25), AO48 (7.23) and Local (6.58). Cultivar Type 8/9 should be widely disseminated as it is a dual purpose crop and can be used both for fodder and seed production.

Table 2. Dry matter yield (t ha^{-1}) of oats under different doses of nitrogen and phosphatic fertilizer

Fertilizer doses N-P (kg ha^{-1})	Cultivars		Mean
	PD2-LV65	Scott	
00 - 00	8.09	7.32	7.71
50 - 25	10.02	8.01	9.02
50 - 50	10.52	8.72	9.62
50 - 75	12.11	10.24	11.18
100 - 25	11.67	9.24	10.46
100 - 50	12.47	10.87	11.67
150 - 25	11.25	10.00	10.63
150 - 75	13.95	11.46	12.71
Mean	11.26	9.48	

Evaluation of cereal-legume mixtures

Ali *et al.* (1995) tested a number of vetch species/lines in the upland of Balochistan and reported encouraging results of its potential as a fodder crop. Therefore an experiment on oats/vetch mixture *vs* nitrogen fertilizer was conducted in the years from 1994-95 to 1996-97. Five oat + vetch seed mixtures (at the rate of 0+100, 25+75, 50+50, 75+25 and 100+0) were used with 75 kg N ha^{-1} and 0 N ha^{-1} (control). It was concluded that the use of nitrogen fertilizer increased dry matter yield of oats grown as sole crop. However the use of nitrogen fertilizer has no effect on dry matter yield of pure vetch crop. In both cases the maximum dry matter yield was obtained from oats-vetch plots sown at 50:50 sowing ratios. Mixtures of vetch with cereals grown for forage production under rainfed farming and low nitrogen input system should include a high proportion of vetch to maximize forage yield and quality (Khan, 1992).

Conclusion

It is concluded that fodder production per unit area could be increased two to three times by using improved varieties and using improved production technology as compared with the traditional cultivation system. Yield potential of improved varieties of oats, lucerne and Vicia species have revolutionized fodder production in uplands of Balochistan. It is suggested that oat cultivars PD2-LV65 and S-81 should be further disseminated among farmers for fodder production both in irrigated and rainfed conditions. It must be sown from first to the third week of November using a fertilizer dose of 150-75kg NP ha^{-1}. Lucerne cv. type 8/9 for irrigated land and vetches under dryland conditions have great potential to boost up fodder production. Also for maximum fodder production, oats and vetch should be planted at 50:50 sowing ratios. Additional studies with early planted oats, barley and even Brassica species are needed to evaluate early productivity of these crops in order to cover fodder deficit periods, i.e. November-December.

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