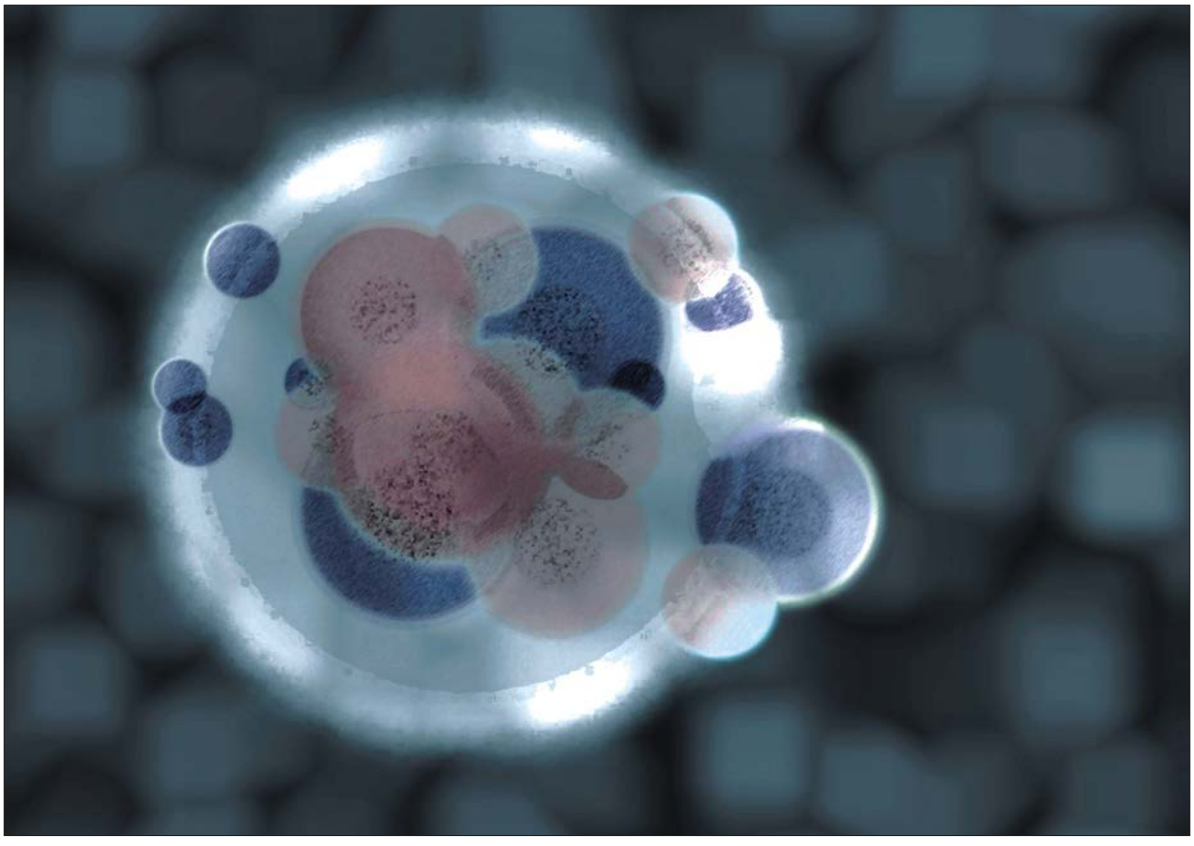

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Performance of summer forage legumes in the sub-tropical sub-humid Pothwar plateau of Pakistan

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Abstract: To determine forage yield and crude protein (CP) content in four legume species viz. cowpea, lablab bean, rice bean and sesbania along with a non-leguminous reference crop of sorghum, a study was carried out . The highest dry weight of 4 t ha^{-1} was obtained from sesbania and sorghum and the lowest dry weight of 2 t ha^{-1} from cowpea was found. Maximum and minimum heights of 144 and 86 cm were obtained from sesbania and rice bean respectively. The highest fresh matter yield of 17 t ha^{-1} while the lowest of 9 t ha^{-1} was obtained from sorghum and lablab beans respectively. The highest crude protein (CP) yield of 581 kg ha^{-1} was recorded from sesbania.

Key words: Forage legumes, forage yield, crude protein, Pothwar plateau

Introduction

The importance of forage crops in agriculture can be gauged from the fact that regular supply of adequate and nutritious forage is always required for livestock production to meet the ever-increasing demand of population and to fulfil the human demands for meat, milk, hides, wool and related by-products (Chaudhry *et al.,* 1985). In Pakistan, shortage of green forage is one of the limiting factor to maintain present livestock population. This shortage is about 40-50% which reaches up to 75% in fodder lean period i.e. May-June and November-December. Pakistan has 21 million hectares of cultivable land but due to shortage of food, arable crops are cultivated even on marginal lands (Bashir *et al.,* 2001). In these circumstances, high yield, good quality forage crops, especially the leguminous ones, must be evolved to bridge the production and demand gap (Iqbal *et al.,* 1998). As a short-term solution, the already available genotypes must be evaluated for their adaptability and high forage yield.

Leguminous forage crops are not only rich in protein but also in minerals and vitamin B (Rupela *et al.,* 1997). Forage legumes increase fertility, control soil erosion and used as cover crops (Ahmad and Anwar, 1986). Intensive cultivation and higher crop yield are likely to affect the soil nutrient status. Legumes help in maintaining soil fertility that contain nitrogen-fixing bacteria (Khan, 1986).

Quality and yield are the main criteria in the production of forage crops and it has been determined by the nutrients they supply. Among these nutrients, CP content is of great importance and it is commonly stated that forage with a higher CP content have superior feeding value (Qamar *et al.,* 1999). Legumes are 2 to 3 times richer than cereals in protein, calcium and phosphorus with more forage yield (Unkovich *et al.,* 1997). Forage yield of crops depends upon its components like height, biomass weight, number of branches and leaves (Schulz *et al.,* 1999). Legumes can produce 3.2 to 8.2 t ha^{-1} dry herbage to meet scarcity of green forage during lean periods (Iqbal *et al.,* 1998).

The experiment was conducted to evaluate the performance of some forage legume crop species, to determine yield and quality in terms of crude protein in different leguminous forage species and comparison to sorghum (check).

Materials and Methods

The study was carried out at the National Agricultural Research Centre (NARC), Islamabad at an altitude of 1300 m. The centre lies in the subtropical, sub-humid continental climatic zone. The climate is characterized by hot summers and cold winters, with some frost events in January. The maximum temperature of the hottest month of June is 40°C while the mean minimum temperature of January is 3°C. The mean annual rainfall is about 1000 mm, 70% of which falls during the summer monsoon season and remaining 30% falls in winter. The soil is slightly alkaline, non-saline, loamy in texture and low in organic matter and major nutrients with exception of available K.

Plot size was 4×8 m^2 with rows spaced 50 cm apart. Four legume species of cowpea (*Vigna unguiculata*), lablab bean (*Dolichos lablab*), rice bean (*Vigna umbellata*) and sesbania (*Sesbania aculeata*) and a non-leguminous reference crop sorghum (*Sorghum bicolor*) were used in the trial. The study was laid out in a Randomized Complete Block Design (Steel and Torrie 1997). The experiment was planted on 4th July, 1998 under natural rainfed conditions without addition of N fertilizer and harvested in the first week of October, 1998 at maturity. Different parameters recorded included plant height, fresh and dry weight and CP content.

For recording plant height five plants at random were measured. Plant biomass was obtained at random with a quadrate of 1 m^2 avoiding edge effect. After recording the fresh weight, the plant material was oven dried at 70°C for 48 hours to obtain dry weight. Plant material was ground and samples were analyzed at the Food Technology Research Laboratory, NARC using the micro-Kjeldahl method (AOAC, 1975).

Results and Discussion

The highest dry weight of 4 t ha^{-1} was obtained from sesbania and sorghum and the lowest dry weight of 2 t ha^{-1} was provided by cowpea. The highest and the lowest fresh matter.

Table 1: Plant height, yield and crude protein in different forage legume species and sorghum

Species	Plant height (cm)	Fresh yield (t ha^{-1})	Dry matter yield (t ha^{-1})	Crude protein content (%)	Crude protein yield (kg ha^{-1})
Sesbania	144	13	4	16	581
Rice bean	86	13	3	20	533
Lablab bean	89	9	3	19	532
Cowpea	116	12	2	21	415
Sorghum	122	17	4	5	175
$LSD_{(0.05)}$	5.9	0.7	0.1	0.6	36.9

yields of 17 and of 9 t ha^{-1} were obtained from sorghum and lablab bean respectively. The highest CP content (21%) was obtained from cowpea and rice bean lablab bean and sesbania and sorghum produced 20, 19, 14 only 5% respectively CP content. Crude protein yield of 581 kg ha^{-1} was recorded from sesbania and the lowest of 175 kg ha^{-1} from sorghum. Sesbania had the maximum height 144 cm while rice bean had the minimum height 86 cm. However, there was a non-significant difference ($p > 0.05$) among all other species except sesbania (Table 1).

The results indicated that legumes like rice bean, lablab bean, cowpea etc. can fulfil this criterion as crude protein percentage rarely falls below 10 percent at all stages of development (Table 1). Legume feed not only improves forage quality but also increases intake of the ration and hence better performance in terms of livestock productivity and production (Osman and Osman, 1982).

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