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EVALUATION OF *SETARIA ANCEPS* AS AFFECTED BY SUMMER LEGUMES IN THE POTHOWAR PLATEAU OF PAKISTAN

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ABSTRACT

Leguminous forages are rich in proteins, minerals and vitamins. Legumes do not only increase soil fertility but also more helpful controlling soil erosion. Increasing leguminous portion in animal diet increases protein content that enhances voluntary intake and digestibility of entire animal diet. *Setaria* grass (*Setaria anceps*) was grown with warm season legumes; i.e. Cow peas (*Vigna ungiculata* var. P-518) and Rice bean (*Vigna umbellata*) in different ratios to evaluate fresh biomass, dry matter yield and moisture contents at the National Agricultural Research Centre under the sub-tropical, sub-humid conditions of the Pothowar Plateau during 2004. The combination of 50% Cow peas and 50% Rice bean showed maximum fresh biomass (1406gm^{-2}), dry matter yield (376gm^{-2}) and moisture contents (73.5%) followed by the combination of 50% *Setaria anceps* (grass) with two summer legumes (25% Cowpeas and 25% Rice bean) having fresh biomass (1047 gm^{-2}), dry matter yield (359 gm^{-2}) and moisture contents (67%). This revealed that alone *Setaria anceps* had the poorest results than the grass legumes mixture and binary legumes mixture.

Keywords: Forage grass, Forage legumes, Forage yield, Pothowar Plateau.

INTRODUCTION

Total area of Pothowar Plateau is approximately 3.0362 x 10^6 ha. According to land capability classification 14.7 percent of the total area is marginal lands which have severe limitations for crop production (Nizami *et al*., 2004). Rainfall of this area is erratic and varies greatly from 1000 mm in north-east to 250 mm in North West part of the region. More than 70% of annual precipitation falls in the summer monsoon period and there is great shortage of forage for livestock during spring and winter seasons (Qamar and Arshad, 2002).

The increasing human population along with high prices of meat in the twin city of Islamabad- Rawalpindi and its adjoining areas signal the need to embark on such programs that could lead to improved livestock productivity. While on the contrary, the forage supply in Plateau is not sufficed to feed livestock properly for attaining up to the mark production potential of the animals. So we need to develop addition sources of forage other then rangelands of Pothowar Plateau to feed livestock properly and thereby improve production potential of the animals.

Ample supply of high quality forage is crucial for producing healthier and economical livestock to satisfy the demand of meat, milk and wool. The low forage production from rangelands has resulted in production of weak and comaciated animals that are prone to diseases.

Grasses are an important component of Gramineae family. Apart form cereals, many grass species provide forage for livestock, protect the soil from erosion, improve soil structure and hence water retention (*Ahmad et al,* 2001). Combinations of grass legume have mainly advantages over the pure grass stands. Legumes, owing to symbiotic nitrogen fixers, supply a good bit of the grass nitrogen needs hence can be grown in soils of low fertility without applying chemical fertilizers (Schulez *et al.*, 1999). Sleugh *et al*. (2000) reported that legumes improved the seasonal distribution of yield and forage quality by being more productive al later harvests. Proteinaceous legumes improve forage feeding value and micronutrient balance especially magnesium, the lack of which may cause grass tetany (Benitez *et al.* 2001). When livestock are fed on diets largely consisting of grasses, protein content often falls below critical level.

Therefore increasing legumes in animal diet will not only increase protein content but also enhance voluntary intake and digestibility of entire diet (Parveen *et.al*. 2001). Legume forages are near equal to concentrates. Bose and Balakrishnan (2000) reported that besides nutritive value legumes in admixture with non leguminous fodder increase the intake of fodder by animals by improving the feed palatability.

The grass species used in the study was *Seteria anceps* which is a native of China. It is one of the world's oldest cultivated crops. Leaf-sheaths longer than the nodes. Flowers two per spiklelet, the upper bisexual. It is generally grown in the 500-700 mm rainfall areas with a summer maximum. It grows quickly and flowers in about 56-62 days. It yields green matter (15-20 t.ha^{-1}) and hay (3.5 t.ha^{-1}). It is extremely palatable and very useful for heavy grazing. The plant has no hair on the lower leaf sheath distinguishing it from dwarf setaria. It is also used in erosion controlling (Skerman and Rivers, 1990). The legumes species used in this experiment are Cow peas (*Vigna unguiculata)* and Rice bean (*Vigna unbellata).*

Vigna ungiculata is a trailing or semi-spreading or bushy, vigorous growing annual with large seeds, blue purple to white flowers, oval to heart shaped leaves and flattened 10-20 cm long pods. It is native of Central Africa and also claimed indigenous India. The green pods are used as vegetable but green vine with pods serve as excellent forage to livestock. It is adapted to a variety of soils with good drainage. It can also be grown as admixture with other forage grasses/fodders (Bose and Balakrishnan, 2000). It is also known as one of the important fodder crop during the lean periods. It is palatable and highly nutritious and rich in protein, calcium and phosphorus than many other summer legumes (Ahmed and Rabbani, 1992). Vigna umbellata is highly branched annual growing to 1-4 m height. It is native of India. The perfuse branches intermingle and intertwine. It is highly drought resistant and performance well even in poor soils (Bose and Balakrishnan, 2000).

Therefore this field study was conducted with the following objectives:

(i) Increasing forage production by growing grass alone and grass legumes mixtures on the marginal lands of Pothowar tract.

(ii) Comparison of number of growth and yield characteristics (Fresh biomass, dry matter yield and moisture contents of grass legumes in alone or combination.

MATERIALS AND METHODS

The study was planned in the experimental area of Rangeland Research Program at the National Agricultural Research Centre, Islamabad, situated in the sub-tropical, sub-humid Pothowar plateau during the year 2004. Summers are very hot and the temperature may rise above 40 ^{o}C in the June and winters are cold with occasional frost events in January. The soil of experimental site was deep, loam and slightly alkaline. No fertilizer was applied at the time of sowing/tuft planting. The experiment was laid out according to Randomized Complete Block Design (RCBD) with five treatments and four replications.

T1= 100% *Setaria acneps* (Grass); T2= 50% *Vigna ungiculata* + 50 *Vinga unbellata*
T3= 50% *Setaria anceps* + 50 % *Vinga unbellata*; T4= 50% *Setaria anceps* + 50% *Vigna uniguiculata*
T5= 50% *Setaria anceps* + 25% *Vigna unguiculata* + 25 % + *Vinga unbellata*

Line sowing was done with manual drill for rice bean and cowpeas while for *Setaria anceps* tuft planting was carried out during the last week of June, 2004 at the onset of monsoon season. The row to row distance was maintained *at 50 cm.* Data were collected on the following parameters.

1. Total Biomass Above Ground: g.m^{-2}

At 50 % flowering stage, total biomass of *Setaria anceps* as well as rice bean and cowpeas was compared in different treatments. Forage production was measured by destructive sampling of dipping using 1m^2 quadrats. Two quadrats were taken in each plot. The total fresh biomass of above ground level was averaged.

Dry matter yield (g m^{-2})

The fresh biomass was placed in bags and oven dried at 70 ^{o}C for 48 hours. The dry weight was measured of each quadrat.

Moisture contents (%)

Moisture contents of all the treatments were measured by using the following formula

$$\text{Moisture contents} = \frac{\text{Fresh biomass} - \text{Dry matter yield}}{\text{Percentage (Fresh biomass)}} \times 100$$

The collected data was analyzed by using Randomized Complete Block Design (RCBD). LSD test at 5 percent level of probability was applied for comparing the treatment means as described by Steel and Torrie (1980).

RESULTS AND DISCUSSION

Investigations were carried out, from June to October 2004, at the experimental area of Rangeland Research Program, National Agricultural Research Centre (NARC), Islamabad. The evaluation of *Setaria anceps* as affected by two summer legumes by using five treatments with four replications. Different parameters such as biomass, dry matter yield and moisture contents (grass, and legumes) were examined and analyzed.

The results in Table -1 revealed that maximum fresh biomass (1406 gm^{-2}) was attained by T_2 (50% *Vigna unguiculata* + 50% *V. umbellate*) followed by T_5 (50% *Setartia anceps* + 25% *Vigna unguiculata* + 25% *Vigna umbellata*) having 1047 gm^{-2} fresh biomass. The combinations of *Setaria anceeps* + *Vigna umbelata* and *Setaria anceps* with *Vigna ungiculata* are statistically at par. The lowest fresh biomass (360 gm^{-2}) was produced by the pure grass stand. These results are similar to those of Odhiambo and Bormke (2001). Regarding dry matter yield similar trend was recorded as mentioned in Table-1. The results are highly significant. T_2 gained the highest position having 376 gm^{-2} while T3 and T5 were statistically at par. These results are in similar with the findings of Mohapatra *et al*., (2001) and Parveen *et al*., (2001).

Data regarding moisture contents were highly significant as mentioned in Table-1. Moisture contents are very important for digestion. More moisture contents relates with more digestion of forages. Maximum moisture contents percentage (73.5) was contributed by binary mixture of legumes followed by tertiary mixture of 50 % *Setaria anceps* + 25% *Vigna ungiculata* + 25% *Vigna umbellate* - 67 percent. All other treatments are statistically at par with each other having 63 percent moisture contents. The relative succulence indicated that these combinations were good for feeding animals because they are likely to have better palatability and digestibility (Ullah *et al.*, 2006)

Table 1. Evaluation of *Stateria anceps* with summer legume on fresh biomass, dry matter and moisture contents.

Treatments	Fresh Biomass ($g.m^{-2}$)	Dry matter yield $g.m^{-2}$	Moisture contents Percentage
T1	360e	131d	63.0 c
T2	1406a	376a	73.5 a
T3	875c	322c	63 c
T4	865 c	359b	63 c
T5	1047b	339c	67 c

Values are means of four replications; * Values followed by same letter(s) are not statistically similar at 5 percent level of significance.

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