

Role of wild leguminous plants in grasslands management in forest ecosystem of Protected Areas of Madhya Pradesh State

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ABSTRACT

Grasslands in melghat forest are of annual , taller type with course grasses. The dominant grasses are *Themeda quadrivalvis* , *Heteropogon contortus* , *Apluda mutica* , *Chloris barbata* . The soil is murmi red with low water holding capacity , in some parts the soil diversity observed black , red soil with clay , silt , sand and loam. The grasses are annual and very few are perennials like *Dicanthium annulatum* , *Dicanthium caricosum* , *Cynodon barberi* , *Bothrichloa bladhii*. The palatability of th grasses depends upon the soil nutrients , chemicals. The soil in which the wild leguminous plants like *Vigna trilobata* , *Phaseolus radiate* , *Glycine max* , *Rhyncosia minima* shows the more distribution of wild leguminous plants the soil is with more nitrogenous content due to biological nitrogen fixation and the soil shows the effects on fodder value of the grasses.

Keywords : Grasslands Protected Areas , palatable grasses , soil fertility , Wild leguminous plants

Introduction

Madhya Pradesh is one of those promising states in India. Whether it's Bandhavgarh or Kanha or Pench, each and every national park is far from the civilization and has a rustic charm of its own. Remarkable flora and fauna of these nine National Parks is matched by scenic landscapes along with the incredible diversity. Who can forget the famous classic novel, the jungle book? Yes, the adventures of the little boy, Mowgli with Sher Khan and Bagheera. The inspiration that lead Rudyard Kipling write Jungle Book was the charm of the Kanha and Pench National Park. Bandhavgarh National Park in Madhya Pradesh has the highest density of tiger population in India.

Grasses in Madhya Pradesh State forest shows the more diversity in their distribution , growth form , phenology due to the topography of the region. The succession trends are observed in the grasses of M. P. forest. According to Agrawal et al. (1961) *Arundenella* spp. Form a higher stage in succession. In the protected areas the species like *Chrysopogon* and *Tripogon* dominates the other grass species. After the well establishment and the good growth form the grasses like *Themeda* , *Heteropogon* , *Ischaemum* , *Apluda* also appear in more forms.

During the present investigation, intensive and extensive survey was undertaken to collect and to study in detail the grasses from Forest of Madhya Pradeshs . The investigation aimed at studying morphology and morphological adaptations, geographical distribution, seed germination and and caryopses morphology of grasses. The dominant grass species in the order of their dominance are *Heteropogon contortus*, , *Chrysopogon fulvus*, *Themeda quadrivalvis* , *Themeda triandra* T. *laxa* , *Apluda mutica* and other common members of the family includes species like *Cymbopogon martineae* , *Eragrostis unioides*, *Setaria intermedia* , *Sporobolus diander*.

The grass vegetation broadly divided into two types depending upon their life-span, Ephemeral vegetation consisting mainly of the grasses that complete the life cycle during rainy season or after rainy season. The species like *Arthraxon lancifolius* , *Arundenella pumila*, *Sporobolus coromondeliana* , *Digitaria abludens*, are the chief components of farmers category. On the contrary the species like *Heteropogon contortus*, *Andrpogon pumulus*, *Chrysopogon fulvus*, *Dicanthium caricosum* , *Setaria intermedia* , which form the autumn vegetation are either perennial vegetation forming large tufts.

The main objectives of the grassland development and management in the protected area of Madhya Pradesh is to know the current ecological status of grasses, enlist the grasses, identification, herbarium preparation, morpho taxonomical study of grasses, types of grasslands, types of grasses annual, perennial, palatable and non palatable, phyto sociological study of grasses, associates of the grasses, role of wild leguminous plants in grasslands, invasive species identification, effects of invasive species, flowering and fruiting season of grasses, role of browsing plants in grasslands, significance of wild fruit trees in grassland development and management. Preparation of grasses seed banks in each relocated sites of the tiger reserve.

Objectives

- Identification and Enumeration of Wild Relatives of Leguminous plants.
- To identify the wild leguminous plants from open grasslands with the help of morphological study by using regional floras.
- Exploration of plants from forest areas.
- To determine diversity of wild leguminous plants and its ecological significance in forest ecosystem.
- Floral association in grassland ecosystem and its role in soil fertility, symbiosis.
- Enumeration and documentation of leguminous plants with reference to GPS co-ordinates, lat-long of the plants.
- Phonological study of the leguminous plants.

Methodology

Grasslands in M.P. forest are observed and studied with reference to ecological aspect – soil texture, colour, Ph, temperature. The grasslands composition studied in rainy and winter season by morphological study and taxonomical study. The weed species are also identified which shows the negative impact on growth of grasses. The wild leguminous plants are identified which belongs to Leguminosae (Fabaceae), the wild leguminous plants are identified with the help of presence of nodulated roots underground, the root nodules play important role in biological nitrogen fixation with the help of nitrogen fixing bacteria. The texture, composition of the soil studied and compared with leguminous plants and without leguminous plants. The main five grasses are selected for study- Themeda quadrivalvis, Heteropogon contortus, Dicanthium annulatum, Chloris barbata and Digitaria abludens. The association of these grasses with leguminous plants studies. The phytochemistry of the selected grasses observed and studied with reference to distribution of Ash, Protein, Fiber, Water and organic content with the standard chemical analysis method with the help of spectrophotometer, flamephotometer, N kjeldas assembly.

The phytochemical data grasses with leguminous plants and grasses without leguminous plants are studied and compared.

Sr. No	Study site	Coordinates
1	Pench Tiger Reserve	21° 41' 35" N, 79° 14' 54" E
2	Satpura Tiger Reserve	22°29'42"N 78°13'52"E
3	Bandhavgarh National Park	23°41'58"N 80°57'43"E
4	Kanha Tiger Reserve	22°20'N 80°38'E
5	The Sanjay National Park	23°53'7"N 82°3'19"E

6	Panna National Park	24°43'49.6"N 80°0'38.8"E
7	Van Vihar National Park	23°13'48"N 77°21'59"E
8	Kuno Wildlife Sanctuary	25°30'00"N 77°26'00"E
9	Nauradehi Wildlife Sanctuary	23°10'41.31"N 79°12'6.79"E 23°10'41.31"N 79°12'6.79"E

Observations

The grasslands of Madhya Pradesh forest are dominated by three important grasses like *Themeda quadrivalvis*, *Heteropogon contortus* and *Digitaria abludens*, other grasses observed are *Bothriochloa intermedia*, *Bothriochloa pertusa*, *Brachiaria brizantha*, *Chloris gayana*, *Chrysopogon fulvus*, *Cymbopogon citratus*, *Dichanthium annulatum*, *Heteropogon contortus*, *Iseilema laxum*, *Panicum antidotale*, *Panicum maximum*, *Paspalum notatum*, *Sehima nervosum*, *Setaria pumilla*. The grasses are annual as well as perennial, palatable and non palatable. The wild leguminous plants observed are *Atylosia scarabaeoides*, *Centrosema pubescens*, *Clitoria ternatea*, *Desmodium tortuosum*, *Dolichos biflorus*, *Glycine max*, *Indigofera tinctoria*, *Lablab purpureus*, *Phaseolus radiata*, *Rhynchosia minima*, *Sesbania aegyptica*, *Stylosanthes hamata*, *Vigna trilobata*, *Vigna sublobata*.





Sr. No.	Locality	GPS Coordinates	Wild legume species	Remarks
1	Pench Tiger Reserve	21° 41' 35" N, 79° 14' 54" E	<i>Atylosia scarabaeoides</i> ,	Herbaceous climber with 4 seeded pods, leaves trifoliate, hairy, roots nodulated, shows association with <i>Themeda quadrivalvis</i> , <i>Heteropogon contortus</i> , <i>Chloris barbata</i> grasses
		21° 41' 29" N, 79° 14' 36" E	<i>Cajanus scarabaeoides</i>	Herbaceous small climber with 2- 4 seeded pods, leaves trifoliate, roots nodulated, shows association with <i>Themeda quadrivalvis</i> , <i>Heteropogon contortus</i> , grasses
2	Satpura Tiger Reserve	22°35'09.9"N 78°23'59"E Mogra East Pachmarhi	<i>Ureria picta</i> (Banghewada)	Rare wild legume in Madhya Pradesh forest. Shows association with smaller and taller grasses.
		22°35'27.3"N 78°20'80.6"E Raikheda	Wild legumes <i>Atylosia scarabaeoides</i> , <i>Phaseolus vulgaris</i> , <i>Rhynchosia minima</i> , <i>Rhynchosia maxima</i>	Wild legumes present in open grasslands, associated with <i>Heteropogon</i> , <i>Digitaria</i> , <i>Themeda</i> , <i>Dichanthium</i>
		22°35'18.7"N 78°24'56.5"E Mogra East Pachmarhi	<i>Rhynchosia minima</i> , <i>Atylosia scarabaeoides</i> , <i>Vigna trifolia</i> <i>Vigna unguolata</i>	Germ plasm plot of STR in which all legumes are present. Generic diversity plot of wild





			(Banbarbati) <i>Phaseolus vulgaris</i> <i>Ureria picta</i> , <i>Indigofera triga</i>	leguminous plants.
		22°30'09.8"N 78°24'41.5"E Badkachar West Pachmarhi	<i>Cajanus scarabaeoides</i>	Herbaceous small climber with 2- 4 seeded pods , leaves trifoliolate , nodulated root system.
		22°33'32"N 78°21'25.7"E Nandkot East Pachmarhi Compartment no. 400 22°33'45.2"N 78°19'25.7"E Nandkot	<i>Atylosia scarbioides</i> , <i>Vigna radiata</i> <i>Vigna unguilata</i> (Banbarbati) <i>Phaseolus vulgaris</i> (Wild Moog) , <i>Atylosia</i> , <i>Vigna unguiculatsa</i> , <i>Rhyncosia maxima</i>	Generic diversity plot of wild leguminous plants
		22°33'32"N 78°21'52.7"E Anjandhana	<i>Vigna unguilata</i> (Banbarbati) <i>Cajanus scarabaeoides</i> , <i>Rhyncosia maxima</i> <i>Rhyncosia maxima</i>	Herbaceous climber with trifoliolate leaves
		22°25'43.2"N 78°21'22.6"E Rorighat West Pachmarhi	<i>Cajanus scarabaeoides</i>	Herbaceous small climber with 2- 4 seeded pods , leaves trifoliolate , nodulated root system. Shows association with <i>Heropogon contortus</i> .
		22°33'23.3"N 78°12'3.2"E Pattan STR Madhai	<i>Cajanus scarabaeoides</i>	Herbaceous small climber with 2- 4 seeded pods , leaves trifoliolate , nodulated root system. Shows association with <i>Heropogon contortus</i> , <i>Dicanthium caricosum</i> .
		22°26'46.8"N 78°10'13.2"E Dhai grassland STR	<i>Cajanus scarabaeoides</i>	Herbaceous small climber with 2- 4 seeded pods , leaves trifoliolate , nodulated root system. Shows association with <i>Heropogon contortus</i> , <i>Themeda quadrivalvis</i>
		22°34'11.1"N 78°88'29.08"E Dhargaon East Pachmarhi	<i>Cajanus scarabaeoides</i> <i>V. radiata</i> var. <i>sublobata</i> , <i>V. trilobata</i>	Herbaceous small climber with 2- 4 seeded pods , leaves trifoliolate , nodulated root system. Shows association with <i>Digitaria</i> , <i>Heteropogon</i> , <i>Themeda</i>
		22°26'66.4"N 78°15'77.04"E Bori wildlife sanctuary	<i>Cajanus scarabaeoides</i>	Herbaceous small climber with 2- 4 seeded pods , leaves trifoliolate , nodulated root system. Shows association with <i>Heteropogon</i> ,






				<i>Themeda</i>
		Sakot	<i>Vigna aconitifolia</i>	Rare wild leguminous plant in sandy soil associated with <i>Digitaria bicornis</i> grass
		22°34'17.6"N 78°22'15.07"E Nayakheda	<i>Cajanus scarabaeoides</i> <i>V. radiata</i> var. <i>sublobata</i> , <i>V. trilobata</i>	Herbaceous small climber with 2- 4 seeded pods , leaves trifoliolate , nodulated root system.Shows association with <i>Digitaria</i> , <i>Heteropogon</i> , <i>Themeda</i>
		22°33'54.6"N 78°19'12.5"E Dhargaon (STR)	<i>Cajanus scarabaeoides</i> , <i>Rhyncosia maxima</i> <i>Rhyncosia maxima</i>	Herbaceous climbers associated with taller grasses in open grasslands.
3	Bandhavgarh National Park	23°41'58"N 80°57'43"E Tala grasslands BTR	<i>Indigofera cordiata</i>	Rare Wild leguminous prostrate plant distributed in sandy soil associated with <i>Saccharum spontanium</i> grass
		Magdhi BTR	<i>Cajanus scarabaeoides</i>	Rare distribution in BTR
4	Kanha Tiger Reserve	22°09'37,6"N 80°39'54,2E Adwar grassland KTR	<i>Rhyncosia minima</i> , <i>Atylosia scarbioides</i> , <i>Vigna trifolia</i> <i>Vigna unguilate</i> <i>Banbarbati</i> <i>Phaseolus</i>	Germ plasm plot of KTR in which all legumes are present. Generic diversity plot of wild leguminous plants. Associated with taller grasses
		22°07'24.9"N 80°49'42.7E Zolar grassland	<i>Rhyncosia minima</i> , <i>Atylosia scarbioides</i> , <i>Vigna</i>	Wild leguminous plants distributed in clay type of soil. Shows association with <i>Dicanthium</i> , <i>Digitaria</i> , <i>Iselima laxum</i>
5	The Sanjay National Park	23°53'7"N 82°3'19"E	<i>Cajanus scarabaeoides</i>	Herbaceous small climber with 2- 4 seeded pods , leaves trifoliolate , nodulated root system.Shows association with <i>Heteropogon</i> , <i>Themeda</i> In Sanjay Tiger Reserve wild leguminous plants distribution is less.
6	Panna National Park	24°43'49.6"N 80°0'38.8"E	<i>Cajanus scarabaeoides</i>	Herbaceous small climber with 2- 4 seeded pods , leaves trifoliolate , nodulated root system.Shows association with <i>Heteropogon</i> , <i>Themeda</i> In Panna Tiger Reserve wild leguminous plants distribution is rare because of dry landscape and soil texture.

		24°634'11.4"N 79°96.0'18"E <i>Pipartola grassland</i>	<i>Cajanus scarabaeoides</i> , <i>Indigofera trifolia</i>	<ul style="list-style-type: none"> ▪ <i>Herbaceous climber modify soil nutrients , association of grasses.</i> ▪ <i>Both leguminous plants grow in dry climate and soil conditions</i>
7	Van Vihar National Park	23°13'48"N 77°21'59"E	<i>Cajanus scarabaeoides</i>	<i>Herbaceous small climber with 2- 4 seeded pods , leaves trifoliolate , nodulated root system. Shows association with Heteropogon.</i>
8	<i>Kuno Wildlife Sanctuary or Palpur-Kuno Wildlife Sanctuary</i>	25°45'26"N 77°08'45"E <i>Durendi grassland Kuno</i>	<i>Rhyncosia minima</i> , <i>Atylosia scarbioides</i> , <i>Vigna trifolia</i> <i>Vigna unguolata</i> (<i>Banbarbati</i>) <i>Phaseolus vulgaris</i> , <i>Vigna radiata</i> var. <i>sublobata</i> , <i>Vigna radiata</i> var. <i>radiata</i>	<p><i>Germ plasm plot of Kuno Wildlife Sanctuary in which all legumes are present.</i></p> <p><i>Generic diversity plot and germ plasm bank of wild leguminous plants. Associated with taller grasses.</i></p> <p><i>Generic and species diversity of wild leguminous plants in Madhya Pradesh state</i></p>
		25°45'27"N 77°08'46"E <i>Durendi grassland Kuno</i>	<i>Sesbania spinosa</i>	<i>Tall herbaceous wild leguminous plant indicator of dry soil conditions. Biological indicator of soil conditions.</i>
		25°45'25"N 77°08'48"E <i>Durendi grassland Kuno</i>	<i>Vigna unguolata</i> (<i>Banbarbati</i>) <i>Phaseolus vulgaris</i> , <i>Vigna radiata</i> var. <i>sublobata</i> , <i>Vigna radiata</i> var. <i>radiata</i>	<p>1)<i>Herbaceous climber with trifoliolate leaves.</i></p> <p>2) <i>Herbaceous climber with incised leaves</i></p>
9	<i>Nauradehi Wildlife Sanctuary</i>	23°10'41.31"N 79°12'6.79"E 23°10'41.31"N 79°12'6.79"E	<i>Cajanus scarabaeoides</i>	<p><i>Herbaceous small climber with 2- 4 seeded pods , leaves trifoliolate , nodulated root system. Shows association with Heteropogon , Themeda</i></p> <p><i>In Nauradehi wildlife sanctuary wild leguminous plants distribution is less</i></p>

Table : 6

S. N.	Name of plant species	Image	Identifying characters	Ecological significance
1	<i>Atylosiascarabaeoides</i>		<ul style="list-style-type: none"> ▪ Herbaceous climber , leaves trifoliate , hairy. ▪ Pod 4-5 seeds , pod hairy. ▪ Stem cylindrical. 	Biological nitrogen fixation
2	<i>Crotalaria juncea</i>		<ul style="list-style-type: none"> ▪ Leaf simple ▪ Small herb 1-1.5 feet tall ▪ Flowers yellow , corolla papilionaceous ▪ Pod many seeded, 	Biological nitrogen fixation
3	<i>Crotalaria juncea</i>		<ul style="list-style-type: none"> ▪ Leaf simple ▪ Small herb 1-1.5 feet tall ▪ Flowers yellow , corolla papilionaceous ▪ Pod many seeded 	Biological nitrogen fixation
4	<i>Indigoferatriga</i>		<ul style="list-style-type: none"> ▪ Plant 1-2 feet ▪ Flowers red ▪ Pod 5-7 seeded. 	Biological nitrogen fixation

5	<i>Indigofera enneaphylla</i>		<ul style="list-style-type: none"> ▪ Plant prostrate ▪ Leaf trifoliate ▪ Flowers pink. ▪ Pod 3-4 seeded. 	Biological nitrogen fixation
6	<i>Lathyrusaphaca</i>		<ul style="list-style-type: none"> ▪ Plant prostrate ▪ Leaf simple trilobed ▪ Stem flat red-green ▪ Pod 6-8 seeded 	Biological nitrogen fixation Rare plant of open grasslands
7	<i>Microtylomauniformis</i>		<ul style="list-style-type: none"> ▪ Small herb present in mirmi soil ▪ Leaf simple ▪ Flowers blue with pailionaceous corolla ▪ Pod 4-5 seeded. 	Biological nitrogen fixation
8	<i>Phaseolus vulgaris</i>		<ul style="list-style-type: none"> ▪ Herbaceous climber 4-3 feet ▪ Leaves simple incised ▪ Flowers in group, yellow ▪ Pod 9-10 seeded, smooth seeds black - green 	Biological nitrogen fixation

9	<i>Phaseolus vulgaris</i>		<ul style="list-style-type: none"> ▪ <i>Legume fruit of wild moog.</i> 	<i>Biological nitrogen fixation</i>
10	<i>Rhynchosia maxima</i>		<ul style="list-style-type: none"> ▪ <i>Herbaceous climber , 4-5 feet long</i> ▪ <i>Leaf simple</i> ▪ <i>Flowers yellow</i> ▪ <i>Pods 4 seeded</i> 	<i>Biological nitrogen fixation</i>
11	<i>Rhynchosia maxima</i>		<ul style="list-style-type: none"> ▪ <i>Herbaceous climber , 4-5 feet long</i> ▪ <i>Leaf simple</i> ▪ <i>Flowers yellow</i> ▪ <i>Pods 4 seeded</i> 	<i>Biological nitrogen fixation</i>
12	<i>Rhynchosia maxima</i>			<i>Rhynchosia maxima</i>
13	<i>Rhynchosia minima</i>		<ul style="list-style-type: none"> ▪ <i>Herbaceous climber , 4-5 feet long</i> ▪ <i>Leaf simple , trifoliolate</i> ▪ <i>Flowers yellow</i> ▪ <i>Pods 2-3 seeded</i> 	<i>Biological nitrogen fixation</i>

Results:

Nutritional analysis of grasses in association with wild leguminous plants
 Nutritive evaluation of early blooming grasses (Leaf)

Sr. No.	Name of grasses	Dry matter in %	Ash in %	Crude Fibre in %	Crude Protein in %
1	<i>Apluda mutica</i>	10.2	10.73	28.86	7.3
2	<i>Chloris barbata</i>	36.05	12.4	21.2	7.87
3	<i>Chloris virgata</i>	31.1	13.3	25.76	7
4	<i>Cynodon dactylon</i>	35.55	7.2	27.28	7.75
5	<i>Diacantium annulatum</i>	13.2	10.1	25.32	10.62
6	<i>Diacantium caricosum</i>	31.1	15.8	31.24	11.12
7	<i>Digitaria bicornis</i>	15.35	16.93	21.44	8.12
8	<i>Heteropogon contortus</i>	25.7	10.2	37	9.87
9	<i>Iselima laxum</i>	36.4	19.93	28.32	9.5
10	<i>Paspaladium flavedium</i>	23.1	16.76	31.28	9.12
11	<i>Setaria pumilla</i>	13.7	10.31	22.32	11.37
12	<i>Themeda triandra</i>	70.81	18.8	29.68	8.75
13	<i>Themeda quadrivalvis</i>	61.65	15.83	23.68	10.25

Nutritive evaluation of early blooming grasses (Stem)

Sr. No.	Name of grasses	Dry matter in %	Ash in %	Crude fat in %	Crude Fiber in %	Crude Protein in %
1	<i>Apluda mutica</i>	12.9	16.03	2.96	30.36	5.62
2	<i>Chloris barbata</i>	27	27.5	1.96	29.8	6.25
3	<i>Chloris virgata</i>	25.05	9.66	2.56	28.96	6
4	<i>Cynodon dactylon</i>	30.4	9.06	2.8	32.25	6.25
5	<i>Diacantium annulatum</i>	13.7	11.2	2	28.2	9.62
6	<i>Diacantium caricosum</i>	25.15	10.3	2.44	37.76	8.5
7	<i>Digitaria bicornis</i>	14.45	8.1	2	37.08	6.12
8	<i>Heteropogon contortus</i>	18.6	10.26	2.36	34.52	12.62

9	<i>Iselima laxum</i>	41.65	13.3	1.92	31.92	8
10	<i>Paspaladium flavedium</i>	19.1	15.26	2.32	20.32	8.62
11	<i>Setaria pumilla</i>	9.55	15.73	1.92	30.28	9.8
12	<i>Themeda triandra</i>	51.8	14.72	2.04	35.61	7.75
13	<i>Themeda quadrivalvis</i>	59.9	10.63	2.5	31.4	9.25

Nutritive evaluation of Matured grasses (Leaf)

Sr. No.	Name of grasses	Moisture in %	Dry matter in %	Ash in %	Crude fat in %	Crude Fibre in %	Crude Protein in %
1	<i>Apluda mutica</i>	76.65	24.35	13.63	4.4	36.92	11.75
2	<i>Chloris barbata</i>	76.15	23.85	16.1	2.28	27.32	8.12
3	<i>Chloris virgata</i>	68.95	31.05	19.5	4.48	33.84	7.87
4	<i>Cynodon dactylon</i>	82.85	17.15	11.46	2.5	24.44	10.25
5	<i>Diacantium annulatum</i>	81.65	18.35	22.76	2.52	24.6	7.62
6	<i>Diacantium caricosum</i>	67.3	32.7	27.16	4.68	31.96	13.5
7	<i>Digitaria bicornis</i>	80.3	19.7	12.06	2.76	31.6	10.62
8	<i>Heteropogon contortus</i>	68.65	31.35	13.63	6.36	38.68	13.87
9	<i>Iselima laxum</i>	71.1	28.9	15.13	3.72	37.96	8.87
10	<i>Paspaladium flavedium</i>	71.65	28.35	16.46	4.88	24.4	9.37
11	<i>Setaria pumilla</i>	85.55	14.45	14.17	3.28	25.72	10.37
12	<i>Themeda triandra</i>	73.7	26.3	11.92	3.72	3.96	10.75
13	<i>Themeda quadrivalvis</i>	40.1	59.9	12.66	3.52	34.08	13.5

Nutritive evaluation of Matured grasses (Stem)

Sr. No.	Name of grasses	Moisture in %	Dry matter in %	Ash in %	Crude fat in %	Crude Fibers in %	Crude Protein in %
1	<i>Apluda mutica</i>	81.55	18.45	18.33	3	35.36	8.62
2	<i>Chloris barbata</i>	79.95	20.5	8.53	1.56	30.96	8.87
3	<i>Chloris virgata</i>	59.45	40.55	18.93	2.96	29.2	8.12
4	<i>Cynodon dactylon</i>	83.2	16.8	21	1.84	25.84	9.5
5	<i>Diacantium annulatum</i>	84.95	15.05	19.23	2.36	26.96	7.25

6	<i>Diacantium caricosum</i>	61.7	38.3	19.73	3	37.76	11.62
7	<i>Digitaria bicornis</i>	84.45	15.55	20.13	2.28	34.44	9.87
8	<i>Heteropogon contortus</i>	79.64	20.6	22.73	4.68	40.16	12.25
9	<i>Iselima laxum</i>	66	34	11.3	2.24	29.76	8.62
10	<i>Paspaladium flavedium</i>	79.9	21.1	14.8	3.28	35.2	9.12
11	<i>Setaria pumilla</i>	88.15	11.85	12.12	2.68	28.2	8.5
12	<i>Themeda triandra</i>	68.55	31.45	14.36	2.44	36.44	9.5
13	<i>Themeda quadrivalvis</i>	70.85	29.15	10.26	3.32	32.68	11.25

Discussion

Wild legumes are essential for providing a source of biological nitrogen fixation for enriching soil fertility (15–40 kg fixed N/ha), reduction in land degradation, disease breaks and for mitigating climate change. N₂ fixation values of forage and fodder legumes will be less reliable and also estimates of % Ndfa (nitrogen derived from atmosphere) of fodder legumes in those lands. Legumes fix the atmospheric nitrogen, release in the soil high-quality organic matter and facilitate soil nutrients' circulation and water retention. Based on these multiple functions, legume crops have high potential for conservation agriculture, being functional either as growing crop or as crop residue. Root nodules occur on the roots of plants (primarily Fabaceae) that associate with symbiotic nitrogen-fixing bacteria. Under nitrogen-limiting conditions, capable plants form a symbiotic relationship with a host-specific strain of bacteria known as rhizobia.

Importance of wild leguminous plants:

- Increases fertility of soil
- Changes soil chemical composition
- Promotes the growth of grasses
- Legume presence significantly increased soil fertility, abundance and/or diversity of soil biota.
- Increases fodder value of grasses
- Enrichment of grasslands with leguminous plants.
- Legume presence is a good forest management practices.
- Increases association of grasses , heterogeneous grasslands
- Biological nitrogen fixation increases the % of N in soil.
- Increases the biomass of grasses
- Legumes can improve the resistance of soils to ecosystem disturbances, legumes may enhance the resistances of soil physico-chemical and biological properties to the ecosystem disturbance..
- Maintenance of soil health: leguminous crops fix the atmospheric nitrogen so it requires less inorganic fertiliser which protects the soil from its harmful effect. These crops also add the nitrogen into the soil which improves the soil fertility.

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