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SEASONAL INFLUENCE ON BIOMASS PRODUCTIVITY OF CERTAIN GREEN MANURES

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ABSTRACT

Field experiments were conducted in *kharif, rabi* and summer seasons of 1993 - 94 in the University Experiment Farm at Annamalainagar to assess the seasonal influence on nodulation, biomass production and nitrogen accumulation of three green manures *viz.*, *Sesbania rostrata, S. aculeata* and *Crotalaria juncea*. The different seasons had significant influence on the productivity of green manures. *kharif* season crops performed better followed by summer and rabi *season* crops. The *S. rostrata* green manure produced higher green biomass (27.85 t ha^{-1}) and accumulated higher nitrogen (247 kg ha^{-1}) with abundant stem nodules during *kharif* season. The *S. aculeata* green manure was next best and recorded more root nodules. The *C. juncea* green manure produced lower green biomass and accumulated lesser nitrogen in the soil.

KEY WORDS: Green manures, Seasons, Biomass production, Nodulation, Nitrogen accumulation

The green manures are excellent and cheaper alternative to chemical fertilisers for sustainable agriculture and to overcome the high cost of fertilisers and energy crisis. They add high organic matter and improve the soil fertility and productivity. The utilisation of nitrogen fixing leguminous green manure crops would be a viable component of integrated nutrient management for rice production (Ladha *et al.*, 1988). However there is a wide variation of the productivity of green manures. The season of growing green manures is a prime factor to determine their productivity. Photosensitivity and narrow ecological adaptability greatly restrict the use of leguminous green manure crops to specific seasons and limited environment conditions. But studies on seasonal influence on productivity of green manures are inadequate. Hence the present investigation was carriedout to assess a suitable season for higher productivity of green manures.

MATERIALS AND METHODS

Field trials were conducted at Annamalai University Experimental Farm, Annamalainagar, Tamil Nadu using three green manure crops, *Sesbania rostrata, S. aculeata* and *Crotalaria juncea* to assess a suitable sowing season for their higher productivity. The experiment was laid out in randomised block design with three replications. Each green manure was sown in three seasons viz., *kharif, rabi* and summer in 1993-94. The seeds of the above green manures were sown on June for *kharif* season, October for *rabi* season and on February for summer season.

The soil was clay loam, neutral in reaction, low in available nitrogen (228 kg ha^{-1}), medium available phosphorus (16 kg ha^{-1}), high in available potassium (326 kg ha^{-1}) and low in organic matter (0.7%) . The three green manure crops were harvested at 60 DAS near the ground level for estimating the biomass production. The nitrogen accumulation was computed by multiplying the dry matter production and plant nitrogen content.

RESULTS AND DISCUSSION

Nodulation

The sowing season had significant influence on the nodule production of green manures (Table -1). Among the three season crops, *kharif* crop recorded higher root module of 33.44, 168.17 and 84.91 in *S. rostrata, S. aculeata* and *C. juncea* respectively. The optimum sunshine, the favourable distribution of rainfall and the optimum temperature enjoyed by the crops during this season might be responsible for higher nodule production. The root nodulation was drastically affected in *rabi* season crop. This might be due to

Table 1. Nodule and green biomass production of green manures

Green Manure	Root nodule number / plant			Green biomass productin (t/ha)		
	Kharif	*Rabi*	*Summer*	*Kharif*	*Rabi*	*Summer*
S. rostrata	33.44 (251.77)	22.85 (125.98)	27.20 (141.76)	27.85	13.70	18.83
S. aculeata 168.17	107.04	128.44	24.10	13.20	19.93	
C. juncea 84.91	58.69	63.96	16.93	8.80	12.01	
Mean	95.50	62.86	73.20	22.96	11.90	16.92
(Values in parenthesis indicate stem nodule number)						
CD 5%	14.3	11.55	15.79	5.09	3.72	4.45

shorter sunlight period, heavy rains and water stagnation suffered by the crops. In water logged soils, because of low oxygen levels, the root nodulation process was inhibited (Becker *et al.*, 1988). In summer season, the nodule number was less because of absence of normal root and root hair formation and finally the nodulation (Piha and Munns, 1987).

The root nodulation was significantly higher in *S. aculeata* and was lower in *S. rostrata*. The difference in nodulation pattern of various green manure species is mainly attributed to their genetic character. Although *S. rostrata* quite significantly recorded abundant stem nodules, the root nodulation was very low. This might be due to the fact that after initiation of stem nodules,the root nodulation process declined. Similar findings were reported by Saradha Ramani *et al.* (1992).

Biomass

Biomass production significantly varied in the green manures under different sowing seasons (Table-1). Kharif sown crop produced higher green biomass yield of 22/96 t ha^{-1}. This might be due to increased plant height because of conductive climate in this season (Bhattacharyya and Chatterjee,1990). In rabi season. the vegetative growth was cut short by early flowering resulting in reduced plant height and biomass production. The green manure crop suffered during summer season with hot and drier conditions besides long day light influence and hence resulted in poor vegetative growth (Beri *et al.*, 1989).

Among the green manures, the biomass yield of *S. rostrata* was high in all the seasons. *C. juncea* recorded lower biomass production. The promising performance of *S. rostrata* might be due to higher adaptability to varied range of ecosystems. Similar results were adopted by Sahu and Sahu (1992).

Nitrogen accumulation

The nitrogen accumulation by different green manures varied significantly (Table-2). The *S.*

Table 2. Percentage of nitrogen content and nitrogen accumulation of green manures

Green Manure	% N content in plant sample			Dry biomass production (t/ha)			N supply by one heet are green manure crop (Kg)		
	Kharif	*Rabi*	*Summer*	*Kharif*	*Rabi*	*Summer*	*Kharif*	*Rabi*	*Summer*
S. rostrata	3.66	2.64	3.47	6.75	3.24	4.67	247.05	85.54	162.05
S. aculeata	2.85	2.37	2.88	5.66	3.11	4.77	161.31	73.71	137 38
C. juncea	2.79	2.29	2.60	5.21	2.68	3.77	145.36	61.37	98 02
Mean	3.10	2.43	2.98	5.87	3.01	4.40	184.57	73.54	132.48
CD 5%	0.13	0.25	0.24	1.14	0.74	0.63	18.39	12.91	13.46

rostrata accumulated 247, 86 and 162 kg N ha^{-1} in Kharif, rabi and summer season respectively. The results established the superiority of *S. rostrata* over other two green manures. Higher biomass production and more plant nitrogen content in *S. rostrata* leads to more N accumulation in all the seasons.

The lower nitrogen accumulation in rabi season might be due to poor vegetative growth. The vegetative growth was cut short due to shorter day light period forcing the plant to early flowering and lower plant N content. The biomass production also reduced considerably. The results are in line with the earlier findings of Becker *et al.* (1990) who stated that with the onset of flowering the growth and biological nitrogen fixation were reduced in green manures.

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STUDIES ON THE TIME OF HERBICIDE APPLICATION UNDER DIFFERENT MOISTURE REGIMES IN UPLAND RICE

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ABSTRACT

Field experiments conducted at National Pulses Research Centre, Vamban during the monsoon season of 1996 and 1997 showed that the pre-emergence application of pendimethalin at 1 kg a.i/ha on 3rd DAS followed by hand weeding on 25 DAS recorded significantly higher yield attributes and yield in ADT-36 rice under upland condition. The different moisture regimes did not influence the yield significantly during monsoon season.

KEY WORDS: Moisture regimes, Pendimethalin, Yield attributes, Weed count, Weed DMP, Yield

In upland rice, weeds germinate immediately after sowing and continue to compete with rice plants till harvest. The slow growth and poor vegetative coverage of upland rice pave the way for the dominance of weeds. The absence of submergence limits the success of the pre-emergence herbicides applied. Hence an alternate and viable method suitable for upland condition was felt necessary to suppress the weed flora. In addition, the efficacy of the applied herbicides depends upon the availability of soil moisture. Moody (1989) reported that the herbicide is dependent on soil moisture for activation. Similarly Sankaran and De Datta (1989) observed reduced efficacy of applied herbicides with decline in soil moisture content. Schiller and Indhaphun (1979) observed that effectiveness of herbicide was reduced significantly under dry condition. Hence