International Journal of Botany Studies
www.botanyjournals.com
ISSN: 2455-541X
Received: 12-09-2021, Accepted: 28-09-2021, Published: 13-10-2021
Volume 6, Issue 5, 2021, Page No. 1202-1204

Studies on the economics of different green manure crops seed production in rice based cropping system

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Abstract
Experimental trial was conducted during the 2014-15 at Experimental Farm, Annamalai University, Annamalai Nagar, Tamil Nadu and India to study the seed production potential of different green manure crops in north Cauvery deltaic areas. The experiment was comprised with six treatments *viz*, T_1 - *Sesbania aculeata* (Dhaincha), T_2 - *Crotalaria juncea* (Sun hemp), T_3 - *Phaseolus trilobus* (Pillipesara), T_4 - *Tephrosia purpurea* (Kolinji), T_5 - *Sesbania Speciosa* (Seemai agathi) and T_6 - *Sesbania rostrata* (Manila agathi). The experiment was laid out in randomized block design with four replication. Among the treatments (T_6) found to be a promising with increased seed production potential over than other treatments.

Keywords: daincha, green manure, sunhemp, phaseolus, sesbania and tephrosia

Introduction
Green manure is an age old practice using crops primarily as a soil amendment and a nutrient source for subsequent crops, especially as a source of N and source of soil organic matter content. Leguminous green manures have the potential to reduce the dependency on external N sources and maintain the soil fertility. However, cost escalation of fertilizer, concern for pollution and conservation of natural resources, green manures have again become important, both to researchers and low- input farmers in particular. There has been a renewed research effort and accepted that green manuring is an efficient way of transferring biologically fixed N into the soil (Dommergues, 1982) [3].
In this system, the short duration legume crops are grown and buried in- situ, when they attain 50 per cent flowering stage. This system of on-site nutrient resource generation is most prevalent in Northern and Southern parts of India, where rice is the major crop in the existing cropping systems. Leguminous green manuring crop fixes the atmospheric N in available form, improves the soil health, physical structure, prevents leaching and conserve more soil moisture. Green manuring being a low cost practice, is an alternate way to improve soil fertility status. It has received a new impetus in recent years with an urgent need for increased food production in the country (Virdi *et al.*, 2005) [8]. The present decline trend in crop production or its stagnation of crop yields in India is the accumulative after effect of abounding soil accompanying constraints. The documents of low crop yields are acceptance of inappropriate methods of soil management, across-the-board of the afire of crop residues, non-judicious adoption of agronomic practices. The most common green manure crops which are grown for in-situ green manuring is *sesbania aculeata, Crotalaria juncea, Vigna sinensis, Trifolium alexandrinum* and *Vigna radiata* (Cherr *et al.*, 2006) [2] observed that green manure based system may provide alternative to current approaches of crop production, however the use of green manure may not be economically justified without the provision of multiple services such as Nutrient supply, weed and pest control and also improvement of soil characteristics for crop production. It is an inexpensive, eco-friendly alternative to highly priced fertilizer N and has become an effective technology in economizing the agricultural production system and ensuring the economics of green manures for seed production in rice based cropping system.

Materials and Methods
The experiment was conducted in field number GL -12C of garden land block of Annamalai University Experimental Farm, Annamalai Nagar, during February -June, 2014. The experimental farm is geographically situated at 11° 24 N latitude and 79°44 E longitude at an altitude of + 5.79 meters above mean sea level. The experimental farm is moderately warm with hot summer months. The mean maximum temperature is 33.3°C while the mean minimum temperature is 23.6'C with a mean relative humidity of 80 per cent were recorded during the cropping period. The mean annual rainfall is 1500 mm of which 1000 mm is received during North East Monsoon, 400 mm during South West Monsoon and 100 mm as summer showers. The soil was clayey loam in texture. The soil was low in available N, medium in available P_2O_5 and high in available K_2O. The experiment was laid out in Randomized Block Design with four replications. Plots were marked with dimension as (Gross area) 5.0 m x4.0 m, (Net area) 4.5 m x 3.5 m. The green manure crops examined are T_1 - *Sesbania aculeata* (Dhaincha), T_2 - *Crotalaria juncea* (Sun hemp), T_3- *Phaseolus trilobus* (Pillipesara), T_4 - *Tephrosia purpurea* (Kolinji), T_5 - *Sesbania Speciosa* (Seemai agathi) and T_6 - *Sesbania rostrata* (Manila agathi) were sown at spacing of 45 × 20, 30 x 10, 30 x 10, 30 x 10, 45 x 20 and 45 x 20 cm respectively. Observation on growth and yield attributes were taken on five randomly selected plants from each plot and tagged (economics analysis) the net return was worked

out for different treatments by subtracting the cost of cultivation from the gross return. The mean values were used for statistical analysis as suggested by Panse and Sukhatme (1978) [6].

Results and Discussion

Growth attributes

All the growth attributes were significantly influenced by various green manure crops in rice based cropping system. The growth components *viz.,* plant height, dry matter production, and numbers of branches plant, showed their significance over other treatments. Among the different green manure crops, T_6- *Sesbania rostrata* recorded higher plant height (278.28cm) at the time of harvest and this was followed by the treatment T_5 - *Sesbania speciosa* (223.67 cm). Besides, that the highest dry matter production of 17218.18 kg ha^{-1} was recorded in T_2- *Crotalaria juncea*, and this was closely followed by T3- *Phaseolus trilobus* recorded the dry matter content with a value of 16477.91 kg ha^{-1}. This might be due to genetic potential of the crop to produce more biomass over than other green manures in the experiment. The least dry matter production (2260.11 kg ha^{-1}) was recorded in T_5 - *Sesbania speciosa.* Pertaining to the number of branches, significant difference was noticed in all treatments at the time of harvest. Among those treatments T_4 - *Tephrosia purpurea* was recorded maximum number of branches of 27.60 at harvest. The lowest number of branches (11.71) was recorded in T_6 - *Sesbania rostrata* at the time of harvest stage. Among the green manures, only *Sesbania rostrata* (T_6) produce stem nodules recorded 94.44 and 148.59 at 40 and 60 DAS. This might be due to high rainfall and increased sunshine hours due to higher moisture levels during south west monsoon benefited *Sesbania rostrata* to a greater extent. The above said results are in line with the findings of Dreyfus *et al*., 1984 [4] and Suprakash *et al.*, 2013 [7].

Yield attributes

All the yield attributes and seed yield were shown a positive influence o yield attributes and seed yield among each other manures. The yield attributing characters such as, number of pods plant^{-1}, length of pod^{-1}, number of seeds pod^{-1}, and seed test weight were assessed in the difference species of green manures under rice based cropping system.

Among the green manures crop T_5 - *Sesbania speciosa* recorded maximum number of pods per plant 196.82 at harvest. This was followed by T_6 - *Sesbania rostrata* recorded with a value of 169.37 pods per plant. Among the green manures crop T_5 - *Sesbania speciosa* recorded maximum number of seeds per pod (65.82) at harvest. The next best treatment was T_6 - *Sesbania rostrata* recorded 38.05. Among the green manure crops, T_1- *Sesbania aculeata* recorded maximum seed yield of 472.67 kg ha^{-1}. The next best treatment was T_2-*Crotalaria juncea* recorded (373.08 kg ha^{-1}). This might be due to the effect of foliar nutrients improves the photosynthetic efficiency which ultimately improve the pod weight, number of seeds per pod and hundred seed weight (Kathiresan and Durai samy, 2001) [5].

Economics on seed production potential of green manures

The economic parameters such as gross return, net return, and return rupee^{-1} invested were calculated based on prevailing market price. The data on economics on seed production potential of green manure crops are presented in Table 2. The highest return per rupee invested (Rs. 2.31) was recorded in T_1- *Sesbania aculeata* which was closely followed by *Tephrosia pupurea* (Rs. 2.26) and T_6-*Sesbania rostrata* (Rs. 2. 16). The lowest return of (Rs. 1.24) was actuated with T_3- *Phaseolus trilobus*. The net income, BCR was high with rice fallow conditions crop of T_1- *Sesbania aculeata* as compared to other green manure crops. The present results are agreement with earlier findings of (Chaudhari *et al*., 2013) [1], and this with followed by T_4- *Tephroisa purpurea.* The least net income, BCR was recorded T_3-*Phaseolus trilobus*. with respect to economics of green manures for seed production in rice based cropping system, T_1-*Sesbania aculeata* gave highest benefit cost ratio of Rs.2.31. This was followed by T_4- *Tephrosia purpurea* with Benefit cost ratio of Rs.2.26. The least benefit cost ratio was Rs.1.24 recorded in T3-*Phaseolus trilobus*.

Conclusion

From the above experiment, it is concluded that T_1-*Sesbania aculeate* is a superior green manure crop to achieve higher seed yield and benefit cost ratio than other green manures in Cauvery deltaic areas rice based cropping system.

Table 1: Growth and yield attributes of different green manure crops at harvest.

Treatments	Plant height (cm)	Dry matter Production (kg ha^{-1})	Number of pods plant^{-1}	Pod length (cm)	Number of seed pod^{-1}	Seed yield (kg ha^{-1})
T_1 - *Sesbania aculeate*	202.50	6162.00	108.35	17.55	25.41	472.67
T_2 - *Crotalaria juncea*	215.51	17218.18	106.65	2.90	11.66	373.08
T_3 - *Phaseolus trilobus*	126.37	16477.91	21.83	3.78	4.48	345.52
T_4 - *Tephrosia purpurea*	139.95	7870.54	106.46	5.25	4.70	318.66
T_5 - *Sesbania Speciosa*	223.67	2260.11	196.82	27.83	65.82	292.77
T_6 - *Sesbania rostrata*	278.28	2369.63	169.37	22.99	38.05	306.54
$S.E_m$	1.11	194.19	0.43	0.33	0.42	6.61
CD (P=0.05)	2.38	413.92	0.92	0.71	0.91	14.10

Table 2: Economics on seed production potential of different green manure crops

Treatment	Cost of cultivation (Rs ha^{-1})	Gross income (Rs ha^{-1})	Net income. (Rs ha^{-1})	Return rupee^{-1} invested
T_1 - *Sesbania aculeate*	18348.57	42540.3	24191.73	2.31
T_2 - *Crotalaria juncea*	20220.22	29846.4	9626.18	1.47
T_3 - *Phaseolus trilobus*	16618.62	20731.20	4112.58	1.24
T_4 - *Tephrosia purpurea*	16895.00	38239.2	21344.20	2.26
T5 - *Sesbania Speciosa*	17463.00	29277.00	11814.00	1.67
T_6 - *Sesbania rostrata*	18399.00	39850.2	21451.2	2.16

References

1. Chaudhari MP, Patel DD, Miss Patel RD, Patel TU, Patel HK. Response of dhaicha (*Sesbania aculeate* L.,) to spacing and nutrient management under south Gujarat condition. An International e-Journal.,2013:2(2):217-224.
2. Cherr CM, Scholberg JMS, Mesorley R. Green manure approaches to crop production: A synthesis. J. Agron.,2006:98:302-319.
3. Dommergus YR. Scarcely explred means of increasing the soil N pool through biological N_2 fixation In: Weather soil research 12th Int. congre. Soil sci, Indian soc., IARI, New Delhi, 1982, 138-149
4. Dreyfus BL, Alazard D, Dommerguues YR. New and unusual micro organiss and niches. Stem nodulating rhizobia. In: Currnet perspective in microbial ecology, Ammerican society of Microbiology, Washington. DC, 1984, 161-169.
5. Kathiresan G, Duraisamy K. Effect of clipping and diammonium phosphate spray on growth and seed yield of daincha (Sesbania aculeata) Ind. J. Agron., 2001:46(3):568-572.
6. Panse VG. Pandurang Vasudeo Sukhatme. Statistical methods for Agricultural workers. Indian Council of Agricultural Research, 1978 - Agriculture - 347
7. Suprakash Saha, Monidipta Saha, Amit Ranjan Saha, Sabyasachi Mitra, Surja BB, Sarkar Kumar *et al*. Intraction effect of potassium and sulphur fertilizer on productivity and mineral nutrition of sunhemp. J. Appl. Sci.Res.,2013:36:1191-1200.
8. Virdi Kamal Deep Singh, Joshi Neha and Singh Sarvjeeet. Green manuring an alternate way to improve soil fertility. I ndian Fmg., 2005, 19-21.