



RESEARCH PAPER

Performance and evaluation of seed production of green manure crop sunnhemp (*Crotalaria juncea* L.) in rice fallow situation

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Abstract : In agriculture, green manure is created by leaving uprooted or sown crop parts to wither on a field so that they serve as a mulch and soil amendment. The plants used for green manure are often cover crops grown primarily for this purpose. The green manuring is the easiest and cheapest way to enrich the soil fertility besides adding huge amount of organic carbon to the soil and also which prevents soil erosion. The non-availability of green manure seed preceding to paddy is major a constrain at farmers level. In rice fallow pulses the yields are declining due to severe incidence of YMV and farmers are unable reap the pulses in rice fallow situations. Keeping in view of the present scenario in rice fallow pulses, this study on performance of seed production of green manure crops for seed availability and profitability were taken up in farmers fields as On Farm Testing. In the present study the performance of, sunnhemp (*Crotalaria juncea* L.) was studied for seed yield in rice fallow situation during *Rabi*, 2018-19 and *Rabi*, 2019-20 under rainfed ecosystem by DAATT Centre in collaboration with Department of Agriculture. The On-Farm Trails (OFTs) were conducted at farmers fields in 7 locations randomly covering entire district in *Rabi*, 2018-19 and *Rabi*, 2019-20. Observations were recorded on days to maturity and seed yield. The results revealed that significantly higher seed yield was observed in sunnhemp. Seed yield increase was achieved to a tune of 84.00% in sunnhemp crop (1179 kg ha^{-1}) over control. The increase in seed yield could be attributed to the performance of sunnhemp crop in-terms of more growth and yield components. The farmers realized that, sunnhemp is best suitable green manure crop for seed production in Visakhapatnam district of North Coastal Zone, Andhra Pradesh.

Key Words : Sunnhemp, Rice fallow situation, OFTs, Yield

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INTRODUCTION

India has changed from a region of food scarcity to food sufficiency by increased fertilizer use with

subsidized prices, but use of organic manures including green manure, declined substantially. Inorganic fertilizers are becoming more expensive, therefore sustainability

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of soil productivity has become a question. Hence, alternate sources to supplement inorganic fertilizers are thought. Green manuring is a low cost and effective technology in minimizing cost of fertilizers, enhance the soil structure and safe guarding the crop productivity. Crops grown for the purpose of restoring or increasing the organic matter content in the soil are called Green manure crops. Use of green manure crops in cropping system is called 'Green manuring' where the crop is grown *in situ* or brought from outside and incorporated when it is purposely grown.

Green manure crop should possess the characteristics such as; multipurpose use, short duration, fast growing, high nutrient accumulation ability, tolerance to shade, flood, drought and adverse temperatures, wide ecological adaptability, efficiency in use of water, early onset of biological nitrogen fixation, high nitrogen accumulation rates, timely release of nutrients, photoperiod insensitivity, high seed production, high seed viability, ease in incorporation, ability to cross-inoculate or responsive to inoculation, pest and disease resistance and high N sink in underground plant parts. In line with these properties, Sunhemp (*Crotalaria juncea* L.) and dhaincha (*Sesbania aculiata* L.) are the suitable species for green manuring with high biomass production as 20-25 t/ha (Thipathi *et al.*, 2013).

The lack of availability of adequate quality seed at appropriate time at reasonable price for small and marginal farmers becomes a major constraint in Sunhemp and dhaincha cultivation. Quality seed production of sunhemp and dhaincha has given meager importance in spite of huge demand from farmers. Further, possibility of seed production under rice fallow situation paves way for identification of suitable crop with high water use efficiency and hence, this study was taken up in the farmers fields.

Objectives :

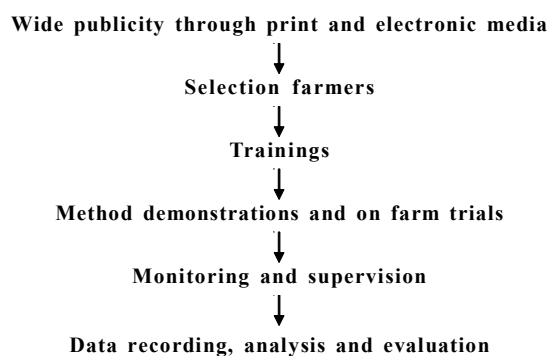
- To create awareness to farmers on green manure seed production *in-situ* in rice fallow situation.
- To evaluate suitable crop of sunhemp for seed production in fallow situation
- To analyze the economics of seed production of green manure crops in Visakhapatnam district at farmers level.

MATERIAL AND METHODS

Scientists in DAATT Centre, Visakhapatnam

district, Andhra Pradesh in collaboration with Department of Agriculture, Visakhapatnam district has identified the farmers and studied the performance of sunhemp crop sowing in rice fallow situation (Chandrasekhar, 2013) by comparing with each other through organizing On-Farm Trials (OFTs) during *Rabi*, 2018-19 and *Rabi*, 2019-20 in 7 locations.

Flow char of handed over of seed production of green manure crops sunhemp (*Crotalaria juncea* L.) rice fallow situation :



Farmer fields are selected to conduct On Farm Trials (OFTs) with suitable soils condition with regulation of water. Sunhemp seeds were broadcasted 7-10 days before the harvest of paddy crop in waxy soil condition in the farmer's fields. Need based plant protection measures were taken up during crop growth period. Observations were recorded on each crop on five randomly selected plants for yield and yield contributing characters *viz.*, days to maturity, plant height (cm), number of branches per plant, number of dry pods, number of seeds/pod, seed yield (kg/ha) and economics. Percentage yield increase in-between crops were calculated and comparative analysis of cost benefit ratio per hectare was arrived and presented in the tables. Simple analysis was done by using Mean only.

RESULTS AND DISCUSSION

The On-Farm Trails on seed production of crops *viz.*, sunhemp were conducted in 7 locations across the district in *Rabi*, 2018-19 and *Rabi*, 2019-20 seasons in farmer fields and yield attributes and yield are depicted in following tables. Seed yield is a complex trait, polygenic and highly influenced by environmental conditions. A successful breeding programme depends upon the genetic variability present among the different genotypes.

Phenotypic selection of parents for hybrids based only on their performance alone may not always be available procedure since phenotypically superior genotypes may yield inferior hybrids and/or poor recombinants in the segregating generations. Hence, simple analysis on mean for days to maturity, plant height (cm), number of branches per plant, number of pods per plant, number of seeds/pod, seed yield (kg/ha) and economics was studied in sunnhemp (Table 1 and 2).

In sunnhemp, plant height varied from 115 to 123cm with an overall mean of 119 cm (Table 1). Number of branches per plant varied from 6 to 8 in sunnhemp (Table 1). Results indicated that for any green manure crop more branches per plant may give more biomass, is desirable trait and there is possibility for improvement through selection of this character and breeder may have reliable benefits in next generation with respect to this

character.

Maturity duration varies from 115 days to 120 days with a mean of 118 days in Sunnhemp (Table 1). Variation in days to maturity provides ample scope for selection of early and late maturing plants for further improvement and the crop matures early. In sunnhemp, number of pods is ranged from 138 to 162 with mean value of 146 (Table 1). In sunnhemp increased vegetative growth and increased number of branches solely attributed to the increased number of pods. This will have direct selection pressure on yield, this criteria may be useful in selection of green manure crop to take up seed production in rice fallow situation.

Average number of seeds per pod in sunnhemp recorded was 12 with a range of 10 to 13 (Table 1). Definitely more number of seeds per pod will have positive correlation with seed yield for selection. Grain

Table 1: Mean data on yield and yield attributes of on-farm demonstrations on green manure crop of sunnhemp seed production conducted rice fallow situation during Rabi, 2018-19 and Rabi, 2019-20

Sr. No.	Name of the farmer and address	Season and year of testing	Plant height	No.of branches	Days to maturity	No.of pods	No.of seed/pod	Seed yield (kg/ha)
			Sunnhemp	Sunnhemp	Sunnhemp	Sunnhemp	Sunnhemp	Sunnhemp
1.	Sri.L.Ainaryana Murthy Vasadi Villlage, Gantiyada Mandal	Rabi, 2015-16	123	8	115	142	12	1250
2.	Sri.S. Ramarao Gollapalle Village, Bobbili Mandal	Rabi, 2015-16	115	7	120	154	10	1050
3.	Sri.Karaka Srinu Koral Village, Gantiyada Mandal	Rabi, 2015-16	118	6	118	162	11	1150
4.	Sri.B.Gnagaraju Timidi Villlage, S.Kota Mandal	Rabi, 2016-17	120	7	115	124	12	1150
5.	Sri.S. Ramarao, Gollapalle Village, Bobbili Mandal	Rabi, 2016-17	119	6	120	138	13	1050
6.	Sri.Karaka Srinu Koral Village, Gantiyada Mandal	Rabi, 2016-17	120	7	118	148	12	1250
7.	Sri.R.Rama Krishna V.P.Regga Village, Garividi Mandal	Rabi, 2016-17	115	8	118	152	11	1350
Average			119	7	118	146	12	1179

Table 2: Mean economics of the green manure crops seed production conducted rice fallow situation during Rabi, 2018-19 and Rabi, 2019-20 seasons

Sr. No.	Particulars	Sunnhemp
1.	Grain yield kg/ha	1179
2.	Grain value (Rs.40/kg)	53055
3.	Cost of cultivation Rs./ha	15000
4.	Net income Rs./ha	38055
5.	C:B ratio	2.54

yield increase was achieved to a tune of 84 % in sunnhemp crop (1179 kg ha⁻¹). The higher yield in sunnhemp crop in rice fallow situation is contributed by more number of pods and supported by profuse plant growth with more number of branches (Triveni, 2011).

Economics :

The cost analysis study revealed that as there is an grain yield (Table 2) of 538 kg ha⁻¹ recorded in n crop in rice fallow situation, the rise in yield of sunnhemp in rice fallow situation might be due to the crop contributed with more number of pods and supported by profuse plant growth with more number of branches in rice fallow situation. Additional net income of Rs. 22710 ha⁻¹ received in sunnhemp seed production with additional cost of cultivation of Rs.1500 ha⁻¹. It was mainly due to the cost of more harvesting charges due to more sunnhemp crop. It was observed that the cost-benefit ratio was also higher (2.54)

Conclusion:

The overall two consequent years study was revealed that the sunnhemp crop performed better in

rice fallow situation in relation to growth and seed yield and it was concluded that sunnhemp crop was ideal to take up green manure seed production during *Rabi* in rice fallow situation and the same seed may be utilized for green manuring in pre *Kharif* season to enrich the soil fertility at farmers level in the district.

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