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Research article

Knowledge and adoption gaps of *Stylosanthes* seed production practices followed by farmers of Anantapur, Andhra Pradesh

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Abstract

A study was carried out to know the knowledge and adoption levels of recommended practices of *Stylosanthes* crop by farmers. The study was conducted in 12 randomly selected villages of 3 blocks of Anantapur district by surveying 120 farmers using a structured interview schedule. The results revealed that knowledge levels were poor for the application of fertilizers (00%), seed treatment (7.5%), top dressing (25%) and row spacing (59.17%). Correspondingly, four practices that the respondents did not adopt were use of recommended seed rate, sowing without seed treatment, not following recommended spacing and fertilizer application at the time of sowing. Herd size and the irrigated area had a positive relationship with the knowledge level of respondents. Herd size, herd composition and cropping pattern showed positive and one variable risk orientation showed a negative and significant relationship with the level of adoption of *Stylosanthes* seed production practices. The study thus brings out the dire need to enhance the knowledge and adoption of critical practices for enhancing seed yield and quality of *Styosanthes hamata*.

Keywords: Correlation, Hindupur, Seed production practices, *Stylosanthes hamata*

Introduction

Stylosanthes is a legume fodder crop rich in protein content (15–18%) that can be cultivated in grasslands or pastures. Animals can feed on it directly. It is adopted to tropical climates and tolerant to low fertility, drought, acidic soils and poor drainage. The highly palatable *S. hamata* species is preferred by animals. Already, most of the grasslands are suffering ecological retrogression and soil erosion (Shinde and Mahanta, 2020). Species of *Stylosanthes* are suitable to provide additional forage, enrich soil nutrients and arrest land degradation (Chandra, 2009). In India, *Stylosanthes* seed production started during the late 1970s. In the mid-1980s, small farmers in the Rayalaseema region, Anantapur district in Andhra Pradesh, started *Stylosanthes* seed production to meet rising demand from government agencies for their wasteland development programs. Some farmers from the Palasamudram village in Anantapur were trained in *Stylosanthes* seed production at the Reddipalli State Farm of the Department of Animal Husbandry and Veterinary Services. Over the years the improved seed production technology spread to surrounding villages through farmer-to-farmer exchange of seeds and technical knowledge. *Stylosanthes* seed production today is largely concentrated in the mandals of Anantapur district comprising a network of 40 to 50 villages. Based on surveys and experimental evidence at four locations around the country, Singh *et al.* (1995) found the Anantapur area as the most suitable for the economic and efficient production of *Stylosanthes* seeds. This district of Andhra Pradesh is one of the poorest regions in the State, with harsh climatic conditions, poor, zinc-deficient soils, and in the *Stylosanthes* seed production area, farm sizes averaging less than 2 ha (Biradar *et al*., 2013). Here, *Stylosanthes* offers a lower risk option than the main crop in the region, groundnut, due to its high drought tolerance, suitability to the soil and climatic conditions, and higher net returns. However, the seed yield of *S. hamata* is low in the region and the total seed yield was reported to be declining (Biradar *et al*., 2013). In

order to understand the reasons, a study on knowledge and adoption of *Stylosanthes* seed production practices followed by farmers was carried out.

Materials and Methods

Location of the study: The study was conducted in Hindupur region of Anantapur district of Andhra Pradesh state, as *Stylosanthes* seed production is predominantly carried out in this region. A *post facto* research design was used. Three mandals of Hindupur-Gorantla, Chilamathur and Somandepalli were selected based on earlier studies conducted by ICAR-IGFRI, Jhansi. Four villages having maximum area under *Stylosanthes* cultivation were selected from each mandal. So, a total of 12 villages were selected. They were Gollapalle, Palasamudram, Vadigepalli and Mallapalle from Gorantla mandal, Settipalli, Kodikonda, Morasalapalli and Reddicheruvapalli from Chilamathur mandal and Bramhasamadram, Edulabalapuram, Chalakur and Julukunta from Samandepalle. From each village, ten respondents were selected randomly, constituting a total sample size of 120. A structured pre-tested interview schedule was used for the collection of data by personal interview method.

Knowledge of Stylosanthes seed production practices: Totally 16 cultivation practices were recommended for the production of *Stylosanthes* seed by ICAR-Indian Grassland and Fodder Research Institute, Jhansi. These 16 practices were listed and respondents were asked to mention whether they have knowledge about the mentioned practices or not. The frequency and percentages for each practice were worked out.

Adoption of Stylosanthes seed production practices: Against each of the recommended practices, respondents were asked to mention the practices they are following. If they are following as per recommendation it was considered as full adoption. If farmers' practice deviated from the recommended practice to a limited extent it was considered as partial adoption. If a particular practice is not followed at all, it is categorized under no adoption. Under these three groups for each practice, frequency and percentages were worked out.

***Statistical analysis*:** Data was analyzed by employing different statistical tools. The frequency (or absolute frequency) of an event 'i' was the number' n_i' of times the observation occurred/recorded in a study. *T*he number (value) of a particular cell was divided by the total number of respondents in a particular category to which the cell belongs and multiplied by a hundred to arrive at the percentage value. In contrast, Pearson's correlation coefficient was computed in order to know the nature of the relationship between the dependent and independent variables. The values of the correlation coefficients were then tested for statistical significance (Snedecor and Cochran, 1989).

Results and Discussion

Knowledge and adoption level of recommended Stylosanthes seed production practices: Findings of knowledge and adoption about *Stylosanthes* seed production practices were recorded (Table 1). The recommended seed rate was 5 to 6 kg/ha, and even though 75% of the respondents had knowledge, none among them were found to be adopting the recommended seed rate. All the respondents were using 30 to 50 kg/acre seed. Wide difference between the recommended seed rate and quantity of seed used by respondents might be due to two reasons. One is that the seed produced by farmers of the region is full of inert material as seed processing demands sweeping the whole field and cleaning several times. Many farmers, especially if they intend to keep seed for their use, might not resort to cleaning properly. The second reason is recommended seed rate is for line sowing, but the majority of respondents resort to broadcasting, which certainly requires more quantity of seed. Respondents thought had knowledge about the recommended dose but, due to resource constraints like labor, tractor to open lines etc might not have resorted to it. When it comes to seed treatment with hot water, only 7.50% of the respondents had knowledge about the practice but none of them adopted this practice. The probable reason for the lack of knowledge might be the lack of extension education on this crop to the growers and those who knew did not adopt it might be due to non-use of pure seed by the respondents. All the respondents had knowledge about the time of sowing at the onset of the monsoon and 100% of the respondents adopted this practice. As per the recommendation, *Stylosanthes* seed must be sown at a depth of one to two cm. About 67.50% of the respondents had knowledge about this, though none of the respondents followed it. With respect to the sowing method, it is recommended to sow manually with a spacing of 0.5 to 1 m X 0.5 to 1 m. However, 59.17% of respondents had knowledge about spacing but none adopted it. Depth of seed sowing and spacing matters only when the crop is sown in lines. However, almost all follow broadcasting, and these two recommendations for the situation thus become not so relevant. The recommended dose of Farm Yard Manure (FYM) was 5 to 8 tonnes/ha which was in the knowledge of 61.66% of respondents. Only 37.50% of respondents partially adopted the recommended dose of FYM. The respondents applied an average of 2.5 tonnes/ha FYM. Availability of FYM depends on a few factors like a number of livestock owned by the respondent, his willingness and ability to purchase as well as his preferential crop to which FYM

Table 1. Knowledge and level of adoption of recommended *Stylosanthes* seed production practices by respondents (n =120)

Cultivation practices	Recommendations	Practices followed	Knowledge level		Extent of adoption		
			Number	Percentage	No adoption	Partial adoption	Complete adoption
Seed rate	5 to 6 kg/ha	30 to 50 kg/ha	90	75.00	120 (100)	0	0
Seed treatment	Hot water soaking	Sowing without seed treatment	9	7.50	120 (100)	0	0
Time of sowing	Sowing at onset of monsoon	-	120	100.00	0	0	120 (100)
Depth of sowing	1 to 2 cm	-	81	67.50	0	0	120 (100)
Sowing methods	Manual	-	120	100.00	0	0	120 (100)
Spacing	0.5 to 1 mX0.5 to 1 m	Broadcasting	71	59.17	120 (100)	0	0
FYM	5 to 8 t/ha	2.5 t/ha	74	61.66	0	45 (37.50)	75 (62.50)
Fertilizer at the time of sowing	10 to 15:30 (N:P) kg/ ha	No fertilizer application at the time of sowing	00	00.00	120 (100)	0	0
Top dressing	30:60:00 (N:P: K) kg/ ha	76.5:60:00	30	25.00	0	100 (83.33)	20 (16.66)
Number of inter-cultivations	Two times	One/two	120	100.00	0	59 (49.16)	61 (50.83)
Time of inter-cultivation	20 to 30 DAS; 50 to 60DAS	-	120	100.00	0	59 (49.16)	61 (50.83)
Frequency of irrigation	Occasional	Once in 12 days	120	100.00	0	80 (66.66)	40 (33.33)
Time of harvesting of crop	Fall of seeds	-	120	100.00	0	0	120 (100)
Method of seed collection	Manual	-	120	100.00	0	0	120 (100)
Seed processing	Sieving mesh	-	120	100.00	0	0	120 (100)
Seed storage method	Gunny bags	Tarples and plastic bags	120	100.00	0	55 (45.83)	65 (54.16)

applied. Many respondents, as *Stylosanthes* is a hardy crop, might not have preferred to apply the recommended dose, though 61.66% had knowledge about it or the FYM produced at respondents' farm family might not be adequate to follow recommendations. For *Stylosanthes* seed production, fertilizers need to be applied two times, that is at the time of sowing and top dressing after one month of sowing. It is recommended to apply 10 to 15:30 (N:P) kg/ha at the time of sowing and 30:60 (N:P) kg/ ha during top dressing. None of the respondents had knowledge about the quantity of fertilizers to be applied at the time of sowing and only 25% of the respondents knew about the quantity of fertilizer to be used during top dressing.

The majority (83.33%) practiced partial adoption, which is 76.5:60:00 kg/ha (N: P: K), which was more than the recommended, which might be due to the apprehension that more seed yield could be realized by applying more chemical fertilizers. It is recommended to follow two inter-cultivations in *Stylosanthes*: 1st at 20 to 30 days after sowing (DAS) and 2nd at 50 to 60 DAS. All the respondents had knowledge about time of inter-cultivation, but 49.16% of them adopted it partially by taking only one inter-cultivation, might be due to high labor wages, labor constraints or not being profitable to take two inter-cultivation. Harvesting of the crop begins when the seed start shedding, commonly in the months of January and February. All the respondents had complete knowledge and adopted this practice fully. It is recommended to harvest the seed manually, followed by sweeping the field to collect the fallen seeds. All the respondents had knowledge and had completely adopted this practice. All the respondents were using sieving mesh for seed processing which is as per the recommendation. These two practices, harvesting when a seed starts shedding and the practice of sweeping, could be learned just by observing the crop behavior. After processing, it is recommended to store seed in gunny

bags, but farmers store it either in heaps covered with tarpaulin or in plastic bags. All the respondents had knowledge about the recommended practice but 45.83% of them adopted it partially and 54.16% of them adopted it completely. Reasons could be non-availability of gunny bags at the time of harvest in respondents' houses, non-willingness to purchase new bags or high price of gunny bags. Respondents might have felt plastic bags or the use of tarpaulin are more convenient for storing the seed. However, storing in plastic bags tends to increase atmospheric relative humidity resulting in an increase in moisture content and deteriorates seed quality to a large extent. It's important to educate growers about the proper method of seed storage.

Meena and Malik (1999), in their study on farmers' knowledge and extent of adoption of improved fodder cultivation practices, revealed that respondents had high knowledge about sowing time and low knowledge about sowing method (43.00%) and varieties (34.33%). Satyapriya *et al.* (2013) reported complete knowledge of critical stages of irrigation for berseem crop and only 38.33% had knowledge about the recommended method of sowing. Meena *et al.* (2017) reported overall knowledge of 61.78% in improved fodder sorghum cultivation practices. Suman *et al.* (2019) found a minimum adoption gap for berseem seed production technologies in land preparation (13.12%) and a maximum for weedicide use (95.69%).

Stylosanthes seed production practices grouped based on level of adoption: *Stylosanthes* seed production practices followed by the farmers were grouped into three groups. Six practices *viz*., sowing at the onset of monsoon, sowing depth of one to two centimeters, manual sowing method, harvesting the crop when seed fall and manual collection of harvested seed and seed processing using sieving mesh were adopted completely. Four practices, namely application of 5 to 8 tons/ha of FYM, top dressing of NPK, two inter cultivations and storing the harvested seeds in gunny bags are the practices which the respondents partially adopted. Four practices which the respondents do not adopt were of recommended seed rate, sowing without seed treatment, not following recommended spacing and fertilizer application at the time of sowing (Table 2). Four practices which are not adopted by the respondents were-use of recommended seed rate, sowing without seed treatment, not following recommended spacing and fertilizer application at the time of sowing. All these recommended operations are not practiced as respondents largely followed broadcasting of seed instead of line sowing. Regarding seed treatment main reason could be lack of knowledge about it as only a few respondents expressed that they knew about this practice. Similar results were reported by Mapiya *et al*. (2006), Meena *et al*. (2017), Sharda *et al*. (2018) and Singh *et al.* (2014).

Relationship of knowledge and adoption of Stylosanthes seed production practices with selected independent variables: Out of 12 independent variables subjected to correlation analysis, two variables, herd size (1% level of significance) and irrigated area (5% level of significance) had a positive relationship with the knowledge level of respondents. Three variables-herd size, herd composition and cropping pattern, showed positive and one variable risk orientation, showed a negative and significant relationship with the level of adoption of *Stylosanthes* seed production practices (Table 3). A similar study was conducted by Meena and Malik (1999) and found that herd size and extension contact had a positive relationship with the knowledge level of respondents regarding improved fodder cultivation practices at 5% level of probability. *Stylosanthes,* though, is grown by farmers for seed production; the crop residue forms an excellent source of fodder for livestock. Being leguminous, it improves the health and productivity of livestock in turn bringing better indirect income to the farmers. Farmers with better knowledge of the crop and value of its crop residue tend to increase their herd size. Knowledge level and irrigated area are related positively and significantly. Those with the irrigation facility are generally big farmers with better education levels. Education enables them to access various information sources to enhance their knowledge level. This might be the reason for a positive relationship between knowledge level and area under irrigation.

Table 2. List of *Stylosanthes* seed production practices based on level of adoption

Completely adopted practices	Partially adopted practices	Not adopted practices
Sowing at onset of monsoon	FYM-5 to 8 t/ha	Seed rate-5 to 6 kg/ha
Depth of sowing-1 to 2 cm	Top dressing-30:60:00(N:P:K) Kg/ha	Seed treatment- Hot watersoaking
Sowing methods-Manual	Number of inter-cultivation-2	Spacing-0.5 to 1 m*0.5 to 1 m
Time of harvesting of crop- Fall of seed pods	Seed storage method-Gunny bags	Fertilizer at the time of sowing-10 to 15:30 (N:P) kg/ha
Method of seed collection-Manual		
Seed processing using sieving mesh		

Table 3. Relationship between adoption of *Stylosanthes* seed production practices with selected independent variables (n = 120)

S. No.	Variables	Knowledge	Adoption
1	Age	0.111	-0.136
2	Education	-0.119	0.072
3	Land holding size	-0.080	-0.044
4	Irrigated area	0.255**	0.077
5	Herd size	0.152*	-0.200*
6	Herd composition	-0.044	-0.190*
7	Cropping pattern	-0.058	-0.029*
8	Extension participation	-0.062	-0.008
9	Farming experience	-0.061	-0.058
10	Experience in *Stylosanthes* seedproduction	-0.060	-0.027
11	Risk orientation	-0.014	0.212*
12	Economic motivation	-0.097	-0.032

*($p < 0.05$); **($p < 0.01$)

Three variables- herd size, herd composition and cropping pattern showed positive and significant relations with the adoption of *Stylosanthes* seed production practices. *Stylosanthes* is an excellent protein source that has a direct effect on the health and milk yield of the animal. More crop residue obtained by the *Stylosanthes* crop, there would be an increase in herd size and herd composition. Also cultivation of *Stylosanthes* crop adds to the cropping pattern followed by the respondents. One variable risk orientation showed a negative and significant relationship with the level of adoption of *Stylosanthes* seed production practices. There is much knowledge about factors influencing the uptake of new agricultural practices. Factors like risk orientation retards the uptake or adoption of new agricultural practices (Kuehne *et al*., 2017).

Conclusion

The study reflected on the lack of knowledge as well as the adoption of important cultivation practices like seed rate, seed treatment, not following spacing and fertilizer application. They largely follow broadcasting, which definitely has a bearing on low seed yield. The importance of recommended practices needs to be made aware to the seed producers. Even demonstrations must be planned in the farmer's field about the benefits of following these practices for higher seed yield. This is the only region in the country where seeds of this particular crop are produced, and the extension system of the study area should realize the uniqueness of Stylo seed production in the region and must take up activities to bridge prevailing knowledge and adoption gaps in *Stylosanthes* seed production.

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