



Awareness Creation on Benefits of Trichoderma-Based Paddy Straw Decomposition among Farmers of Raipur District, Chhattisgarh

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Rice cultivation generates a substantial quantity of post-harvest straw and stubbles. In many rice-growing areas, farmers burn or remove residues to prepare fields for the succeeding crop. Although burning is a quick and inexpensive method, it results in nutrient losses, air pollution and deterioration of the soil environment. Trichoderma-based residue decomposition provides an environmentally safer approach for managing paddy straw and returning organic matter and nutrients to the production system. The present field-based work was undertaken to create awareness among adopted farmers of village Nakti, Raipur district, regarding the use of Trichoderma, particularly CG Trichocap Capsule and CG Trichom developed by Indira Gandhi Krishi Vishwavidyalaya, Raipur. The work included farmer identification, interaction and group discussion, awareness creation, demonstration of mass multiplication of Trichoderma, and field-level demonstration of paddy straw decomposition. A total of 75 respondents were selected for the study, with 40 males and 35 females. The profile of the respondents showed that 53.33 per cent were young, 34.66 per cent were middle-aged and 12.00 per cent were older farmers. Small farmers constituted the largest landholding group (56.00%). Rice was the major Kharif crop reported by 84.00 per cent of respondents. The field activities demonstrated both ex-situ and in-situ approaches for decomposing paddy straw using Trichoderma. The work highlights the importance of practical demonstrations, farmer interaction and extension communication for promoting environmentally safer residue-management practices.

Keywords: Trichoderma, Paddy Straw, Crop Residue Management, Farmer Awareness.

Introduction

Rice is one of the most important crops cultivated in India and occupies a major position in the agricultural economy of Chhattisgarh. The cultivation of rice generates considerable quantities of straw and stubbles after harvesting. The management of these residues is an important concern because farmers commonly burn or remove them from the field for rapid field preparation. Burning may appear convenient because it requires comparatively little time and expenditure, but it contributes to air pollution and causes loss of nutrients contained in crop residues. The report on which this article is based notes that burning of residues can result in losses of nitrogen, phosphorus, potassium and sulphur and can also affect soil organic matter and air quality. The report indicates that rice occupies an average area of about 3.6 million ha in Chhattisgarh, with productivity varying approximately from 1.2 to 1.6 t/ha depending on rainfall. The state has three major agro-ecological zones—Chhattisgarh Plain, Bastar Plateau and the Northern Hill Region of Sarguja—and rice is cultivated under field conditions ranging from upland to extreme lowland. The substantial quantity of residue generated from rice cultivation therefore makes sustainable residue management important for farmers and the environment. Crop residues contain valuable plant nutrients. The report gives typical nutrient

contents of rice straw as 5–8 kg nitrogen, 0.7–1.2 kg phosphorus, 12–17 kg potassium, 0.5–1 kg sulphur, 3–4 kg calcium, 1–3 kg magnesium and 40–70 kg silicon per tonne of straw. Continuous burning or removal of residues may therefore reduce the opportunity to recycle these nutrients within the farm. The report further describes that burning can lead to losses of up to 80 per cent nitrogen, 25 per cent phosphorus, 21 per cent potassium and 60 per cent sulphur, in addition to increasing air pollution and carbon dioxide concentration. Environmentally safer alternatives include incorporation, mulching, use of residues as fodder or bedding material, composting, mushroom cultivation and other productive uses. The report particularly emphasizes microbial degradation of rice residues and identifies *Trichoderma* as a useful biological agent for accelerating decomposition. Indira Gandhi Krishi Vishwavidyalaya has developed CG Trichocap Capsule and CG Trichom for paddy straw decomposition under in-situ and ex-situ conditions. Creating farmer awareness about these technologies can help translate laboratory or institutional knowledge into practical field-level residue management.

Need for *Trichoderma*-Based Paddy Straw Management

Paddy straw is rich in organic material but decomposes relatively slowly under ordinary conditions. Farmers who burn residues obtain rapid field clearance, whereas biological decomposition requires awareness of the appropriate material, moisture and management practices. *Trichoderma*-based decomposition offers a way to accelerate microbial breakdown of crop residues and utilize the biomass rather than destroy it through burning. The use of *Trichoderma* is therefore relevant not only from the perspective of residue disposal but also from the perspective of nutrient recycling and sustainable agriculture. The field work focused on communicating the practical procedure to farmers instead of limiting awareness to theoretical information. Demonstrations were used to show how CG Trichocap Capsule can be multiplied using broken rice and how the resulting material can be used with farmyard manure for field application.

Materials and Methods

Study area and selection of respondents

The study was conducted in Raipur district of Chhattisgarh. There are four blocks in the district, out of which Dharsiwa block was selected randomly. Nakti village was selected purposively because it had more progressive farmers among the adopted villages. The report records a total of 75 respondents, with 15 respondents selected from each of five villages. The farmer profile and field activities presented in the report therefore represent the adopted farmer group covered during the work.

Socio-personal and socio-economic profile of respondents

The socio-personal and socio-economic characteristics of the 75 respondents were documented. Gender, age, education, occupation, landholding, seasonal crop pattern and annual income were considered. These characteristics provide a descriptive picture of the farmer group with whom awareness and demonstrations were conducted.

Table 1. Socio-personal and socio-economic profile of respondents (n=75)

Characteristic	Category	Frequency	Per cent
Gender	Male	40	53.33
	Female	35	46.66
Age	Young (up to 35)	40	53.33
	Middle (36–55)	26	34.66
	Old (>56)	9	12.00
Education	Illiterate	6	8.00
	Can read and write only	4	5.33
	Primary school	25	33.33
	High school	16	21.33
	Higher secondary	11	14.66
	Graduate	7	9.33
	Postgraduate and above	6	8.00

Occupation	Only agriculture	27	36.00
	Agriculture + animal husbandry	12	16.00
	Agriculture + horticulture	9	12.00
	Agriculture + labour	16	21.33
	Agriculture + business	5	6.66
	Agriculture + service	6	8.00
Landholding	Marginal (<2.5 acres)	26	34.66
	Small (2.5–5 acres)	42	56.00
	Medium (5.1–10 acres)	4	5.33
	Large (10.1–25 acres)	3	4.00
Kharif crops	Rice	63	84.00
	Arhar	6	8.00
	Soybean	—	—
Rabi crops	Wheat	47	62.66
	Lathyrus	28	37.33
Annual income	< Rs. 10,000	11	14.66
	Rs. 10,000–30,000	34	45.33
	Rs. 30,000–50,000	26	34.66
	Rs. 50,000–1,00,000	4	5.33

Mass Multiplication of Trichoderma from CG Trichocap Capsule

A practical demonstration was conducted to disseminate the mass-multiplication procedure of Trichoderma from CG Trichocap Capsule. According to the field report, one kilogram of broken rice is first boiled briefly, wiped with spirit, and sieved. After cooling to a medium-hot condition, two CG Trichocap Capsules are mixed with the boiled broken rice. A clean plastic bottle is sterilized by wiping it with spirit, and the inoculated rice mixture is placed in the bottle, leaving about one centimetre of space below the lid. The bottles are kept in a clean room at an average temperature of 25–30°C. The report records that Trichoderma begins to grow around the third day, initially appearing white and later turning green, and becomes ready for application after approximately 7–8 days. The prepared material is removed and finely ground. It is then packed at the rate of 100 g per kg of farmyard manure and stored in a cool and dry place. For seed treatment, the report specifies application of 10 g per kg seed. For field application, it specifies mixing 4–6 kg of the preparation with 40 kg FYM for one acre and applying it during the last ploughing. The practical nature of this demonstration was important because farmers could observe the multiplication process rather than only receive verbal information. The report records farmer participation during the different steps, including 10 farmers during the initial preparation, 13 during subsequent preparation, 8 during preparation of the application material, and 26 during the later application-related activity.

Decomposition of Paddy Straw through Trichoderma

Ex-situ method: Three-layer technique

- Divide the dried paddy straw into three portions.
- Spread one portion in a flat layer on level ground where water is available. The dimensions depend on the quantity of straw.
- Spread a layer of dry fine soil over the straw.
- Sprinkle CG Trichom (10% Trichoderma) at the rate of 1 kg for every 4–5 quintals of paddy straw.
- Add water until the straw layers are adequately moisturized.
- Cover the pile with black polythene or tarpaulin to conserve moisture and leave it covered for about 20–25 days, adding light water if required.
- Turn the pile after 20–25 days manually or with a cultivator/tractor.
- Leave the material in the sun for 4–5 days and run a tractor or disc harrow over it for 4–5 rounds to break the straw.
- Reassemble the material into a 2–3 ft pile, add water and cover it again for 15–20 days.

- Turn and reassemble the pile again, irrigate and cover it for another 10–15 days.
- After approximately 45–60 days, the decomposed material is ready for field use; if wet, it may be spread by tractor or by hand.

In-situ method: Decomposition in the field

The in-situ method begins after harvesting when paddy straw remains in the field. If the straw has been stacked in the middle of the field after harvesting and threshing, the report recommends ploughing twice and spreading the straw evenly. When the straw is spread normally, the field and straw are allowed to dry for about one week. The field is then ploughed with a disc harrow. At the time of the second ploughing, 5 kg of *Trichoderma* fungus is mixed with 50 kg FYM and applied per acre. The field is again ploughed with a disc harrow in the opposite direction; a rotavator may also be used after the last ploughing if available. If wheat is to be grown, the crop may be sown and irrigated while continuing the usual crop-management practices. If paddy is to be sown, the field is irrigated well and left for decomposition. According to the report, the field can be ready for paddy sowing after approximately 15–20 days.

Benefits of *Trichoderma*-based paddy straw decomposition

- Avoids residue burning: Straw can be decomposed in the field instead of being burned, which reduces air pollution and the rise in CO₂.
- Nutrient recycling: Burning causes losses of nitrogen (up to 80%), phosphorus (25%), potassium (21%) and sulphur (60%). Decomposition returns these nutrients to the farm.
- Improved soil health: The organic matter of the straw returns to the soil, which helps maintain soil organic matter and a healthy soil environment.
- Faster decomposition: *Trichoderma* speeds up the microbial breakdown of straw. With the in-situ method, the field can be ready for paddy sowing in about 15-20 days.
- Simple, low-cost technology: *Trichoderma* can be multiplied at home on broken rice from CG Trichocap Capsule and applied in the field with FYM.

Farmer Awareness and Extension Approach

The work demonstrates the importance of extension methods in introducing residue-management technologies. Awareness creation was conducted through direct farmer interaction, group discussions, demonstrations, brochures and leaflets. Meetings with local functionaries and village-level stakeholders were also included. Such a combination of interpersonal communication and practical demonstration allows farmers to understand both the purpose of the technology and its actual method of use. The farmer profile also suggests the need for communication methods that can be understood across different educational and occupational groups. The respondent group included farmers ranging from illiterate respondents to postgraduate and above, while occupations included agriculture alone as well as agriculture combined with animal husbandry, horticulture, labour, business and service. Practical demonstrations can therefore complement written communication and make the technology more accessible to a diverse farmer group.

Discussion

The field work shows that paddy residue management can be approached as an extension education issue as well as an agronomic and environmental issue. Farmers need to know not only that residue burning has disadvantages but also what practical alternatives are available, how much material is required, how it should be prepared and how long decomposition may take. The use of CG Trichocap Capsule for multiplication and CG Trichom for residue decomposition provides a practical technology package described in the report. The respondent profile indicates that the farmer group was diverse in age, education, occupation and landholding. The predominance of small and marginal farmers makes the practicality, affordability and ease of application of residue-management practices particularly relevant. The field demonstrations therefore provided an opportunity to connect the recommended procedure with actual farm conditions. The report also documents repeated contact with

farmers over several dates. Such repeated interaction is important in extension because adoption of a new practice generally requires understanding of the technology, confidence in its procedure and opportunities to observe or discuss its application. The combination of village meetings, group discussions and field demonstrations can strengthen the communication process. The results presented in the report are descriptive. They document the profile of the respondents and the extension activities carried out, but they do not provide a pre-test/post-test awareness score or a statistical measure of adoption. Therefore, the present article describes the awareness-building intervention and the documented farmer profile rather than claiming a quantified change in awareness or adoption.

Challenges and Considerations

Residue decomposition requires attention to moisture, temperature, inoculum preparation, mixing and timing. Farmers may also differ in access to water, FYM, machinery and suitable space for ex-situ decomposition. The ex-situ method requires a designated area and repeated turning, while the in-situ method depends on suitable field operations and availability of implements. Extension efforts should therefore consider the resources available to individual farmers and provide locally practical guidance. Another important consideration is that awareness creation should be continuous. Demonstrations can be supported with simple brochures and follow-up visits so that farmers can repeat the process correctly. Farmer-to-farmer communication and group discussions can also help reinforce learning after the initial demonstration.

Conclusion

Paddy straw management is an important component of sustainable rice production in Chhattisgarh. The field work among adopted farmers in village Nakti, Raipur, focused on creating awareness about Trichoderma-based decomposition as an alternative to residue burning. The work documented the socio-personal and socio-economic profile of 75 respondents and used direct interaction, group discussion, awareness programmes and demonstrations to communicate the technology. CG Trichocap Capsule and CG Trichom, as described in the report, provide practical approaches for multiplication and application of Trichoderma for paddy straw decomposition. Both ex-situ three-layer decomposition and in-situ field decomposition were demonstrated. The experience indicates the usefulness of practical, farmer-oriented extension methods for communicating residue-management technologies. Continued demonstrations, follow-up interaction and locally appropriate technical guidance can support better understanding and use of environmentally safer residue-management practices.