Current Journal of Applied Science and Technology

37(6): 1-4, 2019; Article no.CJAST.52061
ISSN: 2457-1024
(Past name: British Journal of Applied Science & Technology, Past ISSN: 2231-0843, NLM ID: 101664541)

Effect of Plant Leaf Mulching in Ginger on Yield and Soil Health at NICRA Village in Chatra District of Jharkhand: A Review

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Authors' contributions

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

Article Information

DOI: 10.9734/CJAST/2019/v37i630312
Reviewers and Editors: This manuscript was reviewed and approved by ICCRM-2019* Organising committee.

Review Article

Received 21 September 2019
Accepted 01 October 2019
Published 15 October 2019

ABSTRACT

The FLD experiment was conducted in 20 replication (Farmers field) in National Innovation on Climate Resilient Agriculture (NICRA) village Mardanpur in Arra Panchat of Chatra block in Chatra district of Jharkhand on three consecutive year 2014-15, 2015-16 and 2016-17. The FLD experiment was conducted in randomized block design with 2000 m^2 plot size for each technological option. The two technology options are as follows TO-I: (Farmers Practice) Burning of plant leaf in forest area and use as cooking material and transplanting ginger in the month of May without mulching with $N_{100}P_{60}K_{60}$. TO-II: Mulching of ginger field by plant leaf (5 q/ha) with $N_{75}P_{40}K_{45}$. The rationale behind selection of technology option (TO-II) was disseminate scientific recommendations i.e. mulching of ginger field to demonstrated famers convincing the benefit of mulching in the place of burning leaf in forest area. The data on soil chemical analysis before and after mulching, yield and economic was recorded for better interpretation matrix ranking was done for each of intervened treatments on the basis of farmers criteria matrix ranking was accomplished through participatory rural appraisal. Farmer's reaction was measure in five point rating scale. The overall score reflecting the degree of favorable, unfavorable and neutral to the related technology intervention (Negative = 2.5, Natural = 2.3 – 3.5 and positive above = 3.5). Result indicated that on an average ginger yield was 144.83 q/ha in farmers practice where as in technology option (TO-II), it was 187.7 q/ha respectively. Return per rupee spent was also found more in TO-II i.e. 4.99 as compare to farmer practice i.e. 3.88.

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** Note: This paper was presented in International Conference on Crop Residue Management (ICCRM-2019), October 14-15, 2019, Patna, Organised by Bihar Agricultural University, Sabour, Bhagalpur - 813210 (Bihar), India. Conference organising committee completed peer-review of this manuscript.*

Keywords: Plant leaf mulching; ginger; soil health; yield; farmers practice.

1. INTRODUCTION

The state Jharkhand came into existence on 15th November 2000 as a 28th state of union of India after being bifurcated from Bihar state. Its large deposits of minerals provide a solid launching pad for all kinds of industries. The region with an area of 74677 sq km, and a population of 22 million has unlimited scope for growth and development [1]. The Chatra district is one of the 24 district of Jharkhand. The climate is generally dry with average rainfall 1234.5 mm. The temperature varies between 20 to 42.2°. However due to global warming the temperature goes high up to 44°. The district of Chatra is a part of North Chotanagpur plateau. The northwestern region of Jharkhand like Palamu and Garhwa in particular, has been suffering from an extended dry spell which has led to a number of severe impacts in the region [2]. This area is full of several mountains and valley most part of district area fall of forest and stone, Chatra district is well endowed with forest in an area of 226499/sqm which is about 60% out of total geographical area. The most unfortunate part is that the tribal and local villagers in many area still depend on forest as a source of cooking material in the form of wood and leaf of the plant. There are three main crop seasons in Jharkhand region namely, kharif, rabi, and garma (summer) crops. Major kharif crops are rice, bazra and maize etc. Rabi crops are wheat, pulses, gram, and mustard etc. Garma crops are rice, maize, groundnuts and vegetables etc. The land is irrigated by surface water, reservoirs, wells and natural streams, etc [3]. Mahua and Sagwan are the important forest tree in the district. Generally farmers collected Mahua and Sagwan leaf for cooking purpose otherwise however cultivation of ginger under rainfed condition involves high risk and need some moisture conservation techniques to reduce moisture losses specifically during the crop period after the rains. Covering of soil with organic and inorganic materials prevents the extreme changes in soil temperature and creates a micro environment in which moisture loss through evaporation comes down. Most soil organic matter originates from plant tissue. Plant residues contain 60–90 percent moisture [4]. Besides, mulching control weed infestation reduce run off and soil loss, improves physical, chemical and biological properties of soil which leads to better yield of crop [5,6,7].

Keeping the fact under consideration a front line demonstration (FLD) was conducted during 2014-15. 2015-16 and 2016-17 in adopted NICRA Village, Mardanpur of Arra Panchyat in Chatra Block of Chatra district of Jharkhand to assess the effects of mulching plant leaf (Mahuwa and Ghmar) on productivity and profitability with soil health consideration in local farming system as well as extrapolation of the technology to similar micro farming situation.

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2. MATERIALS AND METHODS

The FLD experiment was conducted in 20 replication (Farmers field) in National Innovation on Climate Resilient Agriculture (NICRA) village Mardanpur of Arra Panchat in Chatra block of Chatra district of Jharkhand in three consecutive year 2014-15, 2015-16 and 2016-17. The FLD experiment was conducted in randomized block design with 2000 m^2 plot size for each technological option. The two technology options are as follows TO-I: (Farmers Practice) Burning of plant leaf in forest area and use as cooking material and transplanting ginger in the month of May without mulching with $N_{100}P_{60}K_{60}$ TO-II: Mulching of ginger field by plant leaf (5q/ha) with $N_{75}P_{40}K_{45}$. The rationale behind selection of technology option (TO-II) was disseminate scientific recommendations i.e. mulching of ginger field to demonstrated farmers, convincing the benefit of mulching in the place of burning leaf in forest area. The data on soil chemical analysis before and after mulching, yield and economic was recorded for better interpretation.

Matrix ranking was done for each of intervened treatments on the basis of farmers criteria matrix ranking was accomplished through participatory rural appraisal.

Farmer's reaction was measure in three point rating scale. The overall score reflecting the degree of favourable, unfavourable and neutral to the related technology intervention (Negative = 2.5, Natural = 2.3 – 3.5 and positive above = 3.5).

3. RESULTS AND DISCUSSION

3.1 Soil Analysis before and after Mulching

The soil samples collected before mulching found acidic in soil reaction having average soil pH is 5.5 (Table 1). After application of mulching the average soil pH was slightly increase after three year i.e. 6.2. In case of NPK initially i.e. 271 kg/ha, 24.6 kg/ha and 93 kg/ha, respectively but it was increase after three years i.e. 293 kg/ha N 33 kg/ha P and 107 kg/ha K, respectively.

3.2 Yield

Pooled data (Table 2) shows that on an average ginger yield were 144.83 q/ha in farmers practice where as in Technology option (TO-II) it was 187.7 q/ha was obtained respectively. Technology option TO-II given more score on yield profitability and soil health.

3.3 Economic Assessment

Pooled data on returns Rs./ha (Table 2) shows that higher Rs. 374733/ha in Technology option TO-II i.e. Mulching of ginger field by plant leaf (5q/ha) with $N_{75}P_{40}K_{45}$. whereas Rs 291000 in Technology option TO-I farmers practice, Return per rupee spent was calculated to be Rs. 4.99 in mulching of palnt leaf where as it was Rs. 3.88 in respect of no mulching field. This happened due to relatively low cost involved in plant leaf mulching and reduce use of chemical fertilizer who purchase by farmers on higher cost.

3.4 Farmer's Reactions and Farmers Assessment

Table 3 shows that farmers reaction on use of plant leaf mulching was highly positive in terms of socio cultural compatibility, compatibility with existing farming system, divisibility of technology, simplicity/complexity of technologies, compatibility with internal resources of household, and extent of risk involved. But availability of rated negative by the farmers. As perceived by the farmers treatment TO-II (mulching plant leaf) ranked 1, Although the participants responded positive with respect to tase, Simplicity, pest resistant, insect resistance towards plant leaf mulching produce compare to without mulching produce of ginger.

Table 1. Soil analysis of field before and after mulching

Sl. no.	Parameters	Before	After
01	pH	5.5	6.2
02	N	271 kg/ha	293 kg/ha
03	P	24.6 kg/ha	33 kg/ha
04	K	93 kg/ha	107 kg/ha

Table 2. Yield attribute and economic of ginger as influenced by mulching

Treatment	Yield (q/ha)				Return (Rs./ha)				Average return
	2014-15	2015-16	2016-17	Pooled	2014-15	2015-16	2016-17	Pooled	
TO-I : (Farmers Practice) Burning of plant leaf in forest area and use as cooking material and transplanting ginger in the month of May without mulching with $N_{100}P_{60}K_{60}$	140	146	148.5	144.83	280000	296000	297000	291000	3.88
TO-II : Mulching of ginger field by plant leaf (5q/ha) with $N_{75}P_{40}K_{45}$.	181	186.60	194.5	187.7	362000	373200	389000	374733	4.99

** Families labour cost not included in cost of cultivation*

Table 3. Farmers reaction on mulching of ginger field by plant leaf

Sl. no.	Criteria	Means score	
		T_1	T_2
1	Socio cultural compatibility	3.5	4.5
2	Compatibility with existing farming system component	3.5	3.5
3	Divisibility of technology	3.5	4.0
4	Simplicity/complexity	3.0	3.5
5	Compatibility with internal resource of the household	3.0	4.0
6	Easy availability of related inputs/material	3.5	2.0
7	Element of risk involved	3.0	3.5
8	Visibility	3.0	3.5

4. CONCLUSION

Thus is could be concluded that use of mulching material in ginger is beneficial with regards yield as well as economic as compared to no mulching. It also improved physical and chemical properties of soil resulting improved moisture holding capacity of soil. Forest plant leaf which is generally used by farmers as a cooking material converted as mulching material in the district. This recommendation given district line department NGOs and ATMA for extrapolation in the similar farming community.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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