



Research Article

EFFECT OF TILLAGE AND MULCHING ON YIELD OF RAPESEED CROP IN MON DISTRICT NAGALAND

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Received: September 03, 2019; Revised: September 25, 2019; Accepted: September 26, 2019; Published: September 30, 2019

Abstract: An experiment was conducted at Mon district Nagaland, during 2017-18 to study the effect of tillage and paddy straw mulching on growth, yield attributes of rapeseed (*Brassica campestris* L.) variety TS 38. Minimum tillage with paddy straw mulching increased the plant height, number of seeds per silique, number of silique per plant, seed yield and moisture content of rapeseed crop. Among all the practices zero tillage with paddy straw mulching gave similar results and maximum cost: benefit ratio followed by zero tillage.

Keywords: Tillage, Paddy straw, Mulching, Rapeseed, Soil moisture

Citation: Sachan M.S., et al., (2019) Effect of Tillage and Mulching on Yield of Rapeseed Crop in Mon District Nagaland. International Journal of Agriculture Sciences, ISSN: 0975-3710 & E-ISSN: 0975-9107, Volume 11, Issue 18, pp.- 9088-9090.

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Academic Editor / Reviewer: Dr Sneha Gautam, Ashutosh Sharma, Kishor Dhanpal Gharde, Dmello Basil Rudolph, P. K. Singh

Introduction

In the lowland area of Mon district, Nagaland paddy is the most prevalent crop in the district, but after harvesting of paddy crop very negligible area utilized in second crop, because productivity of post rainy season crop is very low due to moisture deficit during critical periods of crop growth, as much of the rain fall received during the monsoon season is lost as runoff from the hilly terrain. Rapeseed/ toria (*Brassica campestris* L.) belongs to family Cruciferaeae are the major *rabi* oilseed crops of India. India is one of the largest producers of rapeseed in the world, which require cool temperature with adequate moisture for satisfactory growth [1,2]. Mostly it is grown under rainfed condition, minimum or no use of tillage, use of mulch reduces loss of moisture from the soil [3]. Scarcity of water during lean period of *rabi* crops. Moisture conservation through mulching is very effective in increasing its productivity. On the other hand, no or minimum tillage practices are extremely important for save to loss of moisture and increasing the yield. Considering these facts, the present study was undertaken to find out the effect of mulching and tillage practices on growth, yield and moisture conservation of rapeseed crop.

Materials and Methods

The experiments were conducted on sandy loam soil as on farm trial at farmers field under technology demonstration component in National Innovations Climate Resilient in Agriculture (NICRA) project of Aboi, Mon district, Nagaland. The field is located at 26°58' N latitude and 94°95' E longitude with an elevation of 492 meter above sea level. The preceding crop was local paddy (150 days). The soil was acidic (PH 5.0- 5.4) in reaction and medium in available nitrogen (268-278 kg/ ha), phosphorus (20.10 to 27.20 kg/ ha) and potassium (132.8 to 146.50 kg/ ha). Two tillage and mulching practices, viz., zero tillage, farmers practice (conventional tillage), zero tillage with paddy straw mulching, and minimum tillage with paddy straw mulching. No farmyard manure and chemical fertilizers was applied to the crop. The crop was sown in the last week of October continuously in line at a row spacing of 60 cm and thinned one week after germination to spacing of 15 cm plant to plant. For mulching rice straw was spread uniformly over the soil @ 3.0 tonnes/ ha (air dry basis) after thinning. The field experiment was laid out in randomized block design with four replications during the *rabi* season of 2017- 18. Rapeseed variety TS 38 was used after rice fallow in lowland situation.

Results and Discussion

In the initial stage of crop growth 30 Days after Sowing (DAS), there was no significant difference among the treatments in respect of plant height. Paddy straw mulching improved growth in terms of plant height from 50 DAS to harvest of the crop [Table-1]. This might be due to better availability of moisture under mulched condition, found more stored moisture under straw mulching in sandy loam soil. In case of tillage practices, significant difference in plant height was found in the later stages of crop growth from 70 DAS to harvest of the crop. These results are conformity with the findings of [4,5]. In respect of number of silique per plant, the effect of paddy straw mulching was found significant producing the highest silique/plant (122.40) recorded in minimum tillage with paddy straw mulching followed by (120.75) zero tillage with paddy straw mulching and lowest was observed in (99.58) zero tillage practices [Table-2] which might be due to better vegetative growth of the crop. The present findings agreed with that of Agele, et al., (2000) [1]. The highest number of seeds per silique was recorded under minimum tillage with paddy straw mulching (12.85) and least in farmer's practices (9.81). This might be due to the tilth of soil & better moisture in the soil. Mulching with paddy straw out- yielded the other practices [Table-2]. The highest seed yield was observed in minimum tillage with paddy straw mulching (8.95 q/ ha) 31.73% increase over control, followed by zero tillage with paddy straw mulching (8.05 q/ ha) as compared to farmers practice (6.11 q/ ha), similar trend was noticed in leaf yield and 15.57% increase in leaf yield over the farmers practices. Normal tillage with rice straw mulching @ 3.5 tonnes/ ha applied just after linseed sowing, recorded significantly higher seed yield over without mulch treatment [6]. Data presented in [Table-3] revealed that higher percentage of soil moisture was recorded under zero tillage with paddy straw mulching (11.78 & 12.95%) followed by zero tillage (11.17 & 12.12%) in both 0-15 and 15- 30 cm depths of soils. This might be due to reduction of loss of moisture from the soil surface. Ji and Unger (2001) [7] reported higher storage of moisture under straw mulched condition. Data presented in [Table-4] revealed that the estimated calculated value highest gross return (Rs. 20,950) and net return (Rs. 10,440) with cost: benefit ratio (1.99) was recorded in the minimum tillage with paddy straw mulching but maximum cost: benefit ratio (2.08) was observed in zero tillage with paddy straw mulching followed by zero tillage (2.06) cost: benefit ratio as compared to farmers practice (1.37).

Table-1 Growth of rapeseed crop in different stages

Treatment	Plant height (cm)			
	30 DAS	50 DAS	70 DAS	At harvest
Zero tillage	11.20	48.00	53.10	80.34
Zero tillage with paddy straw mulching	12.20	51.30	68.70	100.00
Minimum tillage with paddy straw mulching	11.80	50.70	71.50	102.60
Farmers practice	11.70	48.50	55.10	77.20
Average	11.73	49.63	62.10	89.99
SD±	0.41	1.62	9.34	13.11

Table-2 Yield and yield attributing characters of rapeseed

Treatment	No. of silique/ plant	No of seeds/ silique	Seed yield (q/ ha)	Leaf yield (q/ ha)	One picking
Zero tillage	99.78	9.85	7.10	5.00	
Zero tillage with paddy straw mulching	120.75	10.11	8.05	5.95	
Minimum tillage with paddy straw mulching	122.40	12.85	8.95	6.10	
Farmers practice	102.66	9.81	6.11	5.15	
Average	111.40	10.65	7.55	5.55	
SD±	11.83	1.47	1.22	0.55	

Table-3 Effect of tillage & mulching practices on soil moisture content (%) of rapeseed

Treatment/ days	Soil depth (cm)	Zero tillage	Zero tillage with paddy straw mulching	Minimum tillage with paddy straw mulching	Farmers practice	Average± SD
30 DAS	0-15	13.31	13.71	12.13	11.17	12.58±1.15
	15-30	14.00	14.80	13.20	12.25	13.56±1.09
50 DAS	0-15	11.51	12.21	10.10	9.60	10.86±1.21
	15-30	12.16	12.96	11.50	10.90	11.88±0.88
70 DAS	0-15	10.34	10.92	9.27	8.77	9.83±0.98
	15-30	11.60	12.70	10.21	9.08	10.90±1.58
At harvest	0-15	9.50	10.30	8.60	8.00	9.10±1.00
	15-30	10.73	11.33	9.11	8.51	9.92±1.33
Average± SD	0-15	11.17 ±1.65	11.78 ±1.51	10.03±1.53	9.38±1.36	10.59±1.08
	15-30	12.12 ±1.38	12.95±1.43	11.01±1.76	10.19 ±1.71	11.56±1.21

Table-4 Economic indices of rapeseed cultivation

Treatment	Total Cost (Rs/ ha)	Gross return (Rs/ ha)	Net return (Rs/ ha)	Cost: benefit ratio
Zero tillage	8080	16,700	8620	2.06
Zero tillage with paddy straw mulching	9160	19,075	9915	2.08
Minimum tillage with paddy straw mulching	10,510	20,950	10,440	1.99
Farmers practice	10,780	14,795	4015	1.37
Average	9632.50	17,880.00	8247.50	1.86
SD±	1254.36	2693.36	2923.49	0.339

Maximum cost: benefit recorded might be due to less physical efforts utilized in the tillage practices; less soil moisture retention due to paddy straw mulching with higher productivity. Maximum net return was recorded with no tillage practices followed by reduced tillage in paddy- vegetable pea cropping sequence in Sikkim reported by Singh, *et al.*, (2016) [8]. Sachan (2015) [9] reported that TS 38 variety of rapeseed crop was found suitable and gave more yield with the sowing period of October in rice straw mulching and control as compared to other toria variety like M 27 and Sikkim Sarson.

Conclusion

The importance of minimum or no tillage along with organic mulching, like paddy straw @ 3.0 tonnes/ ha is better realized in terms of their positive effect on improving soil moisture status and maintaining a congenial micro- climate for better growth and development of the rapeseed crop. No or minimum tillage and mulching improved the growth, yield attributes and seed yield of rapeseed.

Application of research: This practice could sustain the productivity of a rice-rapeseed cropping system up to mid- hills of Nagaland

Research Category: Tillage and Mulching

Acknowledgement / Funding: Authors are thankful to the Director, ICAR- Agricultural Technology Application Research Institution, Barapani, Meghalaya and National Innovations Climate Resilient in Agriculture (NICRA) for providing necessary financial support to conduct this research. Authors are also thankful to ICAR-Krishi Vigyan Kendra, Mon, Aboi, 798 603, Nagaland, India

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Research project name or number: NICRA project

Author Contributions: All authors equally contributed

Author statement: All authors read, reviewed, agreed and approved the final manuscript. Note-All authors agreed that- Written informed consent was obtained from all participants prior to publish / enrolment

Study area / Sample Collection: NICRA project of Aboi, Mon district, Nagaland

Cultivar / Variety / Breed name: *Brassica campestris* L

Conflict of Interest: None declared

Ethical approval: This article does not contain any studies with human participants or animals performed by any of the authors.

Ethical Committee Approval Number: Nil

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