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Research Article

GROWTH AND YIELD ATTRIBUTES INFLUENCED BY CROP RESIDUE MANAGEMENT IN SOYBEAN BASED CROPPING SYSTEM

CHAVHAN K.R.*, PATIL K.B. AND JAYBHAYE C.P.
Agriculture Research Station, Buldhana, 443001, Dr Panjabrao Deshmukh Krishi Vidyapeeth, Akola, 444104, Maharashtra, India
*Corresponding Author: Email - kiranrchavhan@gmail.com

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Abstract: The field experiment was conducted at Agriculture Research Station, Buldhana, Dr Panjabrao Deshmukh Krishi Vidyapeeth, Akola, Maharashtra during *Kharif* and *Rabi* season of 2013-14 in split plot design with three replication and twelve treatment combination of crop residue management and fertilizer to work out the effect of recycling of soybean crop residual on the yield of succeeding *rabi* crops. Result indicated that soybean crop residue incorporation treatment significantly higher than non-crop residue incorporation treatment in both the *rabi* crops. In fertilizer treatment 100 per cent RDF to wheat and chickpea recorded significantly highest grain yield. While interaction effects were found non-significant.

Keywords: *Crop residual management, Economics, Yield*

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Introduction

Soybean is known as "Golden bean" and an important oilseed crop after groundnut. In India, soybean is grown on 121.92 lakh ha area with a production of 112.25 lakh MT and productivity of 921 Kg/ ha. In Vidarbha, area under soybean is 19.21 lakh ha with a production of 14.78 lakh MT and productivity of 778 kg /ha [1]. Crop residues (stover) have many potential uses by society: food, feed, shelter, fuel, and soil amendment [2]. This review reveals that crop residues of common cultivated crops are an important resource not only as a source of significant quantities of nutrients for crop production but also affecting soil health.

When crop residues are returned to the soils, their decomposition can have both positive and negative effects on crop production as well as on the environment. Our aim as agricultural scientists are to increase the positive effects. soybean crop residue on the yield of succeeding *rabi* crops and on soil health.

Materials and Methods

The field experiment was conducted during *kharif* and *rabi* seasons of 2013-14 at Agriculture Research Station, Buldhana, Maharashtra. The soil was clayey in texture. The chemical analysis indicated that the soil was low in available nitrogen (186 kg/ha), medium in available phosphorus (15.74 kg/ha) and high in available potassium (281 kg/ha). It was moderately alkaline in reaction (pH 8.00). The organic carbon content was 0.29 per cent. The field experiment was laid out in split–plot design with three replications. The main plot treatments comprised four crop residual management, *viz*., wheat with residue incorporation, wheat with no residue incorporation, chickpea with residue incorporation, chickpea with no residue incorporation and sub-plot treatment were fertilizers *i.e*., 50,75 and 100 per cent recommended dose of fertilizers for *rabi* crops. Soybean 'JS-335 'crop was sown in *kharif* season with all recommended package of practices for soybean residue only. The crop was harvested at maturity and the plots were threshed with thresher at low speed. The soybean residue/stover was collected and spread on each residue incorporation plot @ 3.90 kg per plot (2.0t/ha). The harrowing was undertaken to incorporate the residue in the soil. The seed–bed was prepared and after irrigation, *rabi* crops *i.e*., Wheat 'AKW-1071' and Chickpea 'JAKI-9218' were sown on 26 November 2013, as per treatments recommended dose of fertilizer for wheat 120:60:60 Kg NPK/ha and chickpea 25:50:00 Kg NPK/ha are given to crop. Observation on growth and yield attributes were recorded after harvest of crop.

Results and Discussion

Wheat Equivalent grain yield

Crop residue management

The grain yield of wheat (3671 kg/ha) was significantly influenced due to soybean crop residue treatment [Table-1 and 2]. Similarly, the chickpea grain yield (3045 kg/ha) was also significantly influenced due to crop residue incorporation. Similar trend was observed in ancillary and yield contributing characters. These corroborate finding of Usadadiya and patel (2013) [3].

Fertilizer dose

Linear and significant grain yield increase was observed with increase in fertilizer close in both the crops. The application of 100 % recommended dose of fertilizer to wheat and chickpea recorded significantly highest grain yield (3509 kg/ha) than the 50 % recommended dose of fertilizer (2450 kg/ha), however it was found at par with fertilizer dose (3401kg/ha). These results are closely resembled with those Usadadiya and patel (2013), Karunakaran and Behera (2013) [4] and Singh *et al*., (2008) [5]. Interaction: The interaction effected were found non-significant.

Economics

Crop residue management

The incorporation of soybean crop residue recorded significantly higher gross monetary returns, net gross monetary returns and B:C ratio than no residue incorporation in both the *rabi* crops. Among r*abi* crops wheat recorded significantly higher gross monetary returns (Rs.66607/ha), net gross monetary returns (Rs.37758/ha) and B:C ratio(2.32) as compared to chickpea crop. These results are closely resembled with those Usadadiya and Patel (2013) and Karunakaran and Behera (2013).

Table-1 Wheat equivalent grain yield and economics as influenced by different treatments

SN	Treatments	Grain yield kg/ha	Cost of cultivation	Gross monetary return	Net monetary return	B:C ratio
A	**MainPlot (Crop Residue)**					
	WI-Wheat with incorporation	3651	28312	66071	37758	2.32
	WN -Wheat with no incorporation	3256	25512	58600	33087	2.29
	CI-Chickpea with incorporation	3045	24398	58472	30419	2.24
	CN-Chickpea with no incorporation	2509	21598	48172	23563	2.08
	SE ±	55		1022	982	
	CD at 5%	189		3536	3399	
B	**Subplot (Fertilizer dose)**					
	$F_{1-50\ \%\ RDF}$	2450	23467	45351	20640	1.87
	$F_{2-75\ \%\ RDF}$	3401	24956	63050	36257	2.44
	$F_{3-100\ \%\ RDF}$	3509	26443	65084	36725	2.39
	SE ±	56		1063	1063	
	CD at 5%	169		3187	3187	
C	**Interactions**					
	SE ±	113		2126	2027	
	CD at 5%	N.S.		N.S.	N.S.	

Market Rates: Wheat-Rs.1800/qtl, Chickpea-Rs.3000/qtl, Soybean crop residue incorporated-Rs.2000/ha. (Rate-Rs.110/qtl)

Table-2 Ancillary and yield contributing characters of wheat as influenced by different treatments

Treatment	Plant height (cm)	No.of tillers per plant	Spike length (cm)	No.of grains per spike	100 grains weight (g)
Main plot (crop residue)					
WI- Wheat with incorporation	65.4	4.0	6.8	48.7	3.6
WN -Wheat with no. incorpo^{n}	60.2	3.0	5.8	37.8	3.4
Subplot (Fertilizer dose)					
$F_{1-50\ \%\ RDF}$	60.4	3.1	5.3	39.8	3.3
$F_{2-75\ \%\ RDF}$	62.9	3.5	6.5	44.7	3.5
$F_{3-100\%\ RDF}$	65.3	4.0	7.1	45.4	3.8

Table-3 Ancillary and yield contributing characters of Chickpea as influenced by different treatments

Treatment	Plant height (cm)	No.of branches per plant	No.of pods per plant	100 grains weight (g)
Main plot (crop residue)				
CI- Chickpea with incorporation	29.1	5.0	36.8	24.1
CN - Chickpea with no. incorpo^{n}	26.1	4.1	26.0	21.3
Subplot (Fertilizer dose)				
$F_{1-50\ \%\ RDF}$	24.2	4.1	26.8	19.3
$F_{2-75\ \%\ RDF}$	27.8	4.6	31.9	22.5
$F_{3-100\%\ RDF}$	30.8	5.0	35.6	26.4

Fertilizer dose

The application of 100 % recommended dose of fertilizer to wheat and chickpea recorded significantly higher gross monetary returns (Rs.65084/ha), net gross monetary returns (Rs.36725/ha) as compared to 50 % recommended dose of fertilizer, however it was found at par with 75 % recommended dose of fertilizer. The B:C ratio was found highest in 75% recommended dose of fertilizer (2.44) but at par with 100 % recommended dose of fertilizer (2.39). Interaction: The interaction effected were found non-significant.

Conclusion: Based on result of study, it can be inferred that, maximum grain yield, gross and net monetary return were significantly higher in application of soybean crop residue along with 100 per cent recommended dose of fertilizer to wheat and chickpea.

Application of research: In fertilizer treatment 100 per cent RDF to wheat and chickpea recorded significantly highest grain yield

Research Category: Crop Science

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****Principal Investigator or Chairperson of research: K.R. Chavhan**
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Cultivar / Variety / Breed name: Soybean

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.
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