International Journal of Agriculture Sciences
ISSN: 0975-3710&E-ISSN: 0975-9107, Volume 9, Issue 6, 2017, pp.-3816-3817.
Available online at http://www.bioinfopublication.org/jouarchive.php?opt=&jouid=BPJ0000217

Research Article

ASSESSMENT OF TILLAGE OPERATIONS ON YIELD ATTRIBUTES OF CHICKPEA

JAIN V.K.[1], TRIVEDI H.K.[1] AND BHARGAV K.S.[2*]

[1]Krishi Vigyan Kendra, Ashoknagar, Rajmata Vijayaraje Scindia Krishi Vishwavidyalaya, Gwalior, 474002, Madhya Pradesh
[2]Krishi Vigyan Kendra, Dewas, 455111, Rajmata Vijayaraje Scindia Krishi Vishwavidyalaya, Gwalior, 474002, Madhya Pradesh
*Corresponding Author: Email-ksbhargav@rediffmail.com

Received: August 22, 2016; Revised: January 19, 2017; Accepted: January 20, 2017; Published: February 06, 2017

Abstract- Field experiment was conducted in the year 2011-12 and 2013-14 at farmers fields of Ashoknagar district of Madhya Pradesh to study the performance of Chickpea grown under three tillage practices, *viz.* Tl: 1x Cultivator + 1x (Dutch Foot Cultivator + Clod Crusher), T2: 1 x Cultivator + 2x (Dutch Foot Cultivator + Clod Crusher) and T3: 1x Rotavator. The time savings in tillage operations were recorded in treatment T3 over T2 and T1 were 46.97 and 25.9 percent, respectively. It is evident from data that the fuel consumption in operation of treatment T3 is 14.19 l/ha. However it was 19.16 and 26.73 l/ha in treatment T1 and treatment T2 respectively. It was also recorded highest yield (15.19 qt/ha) was found in treatment T3 and lowest yield in treatment T1 (11.83 qt/ha) which is 28.4% lower. In case of benefit cost ratio, treatment T3 gave 0.49 and 0.32 more B:C Ratio than treatment T1 and T2.

Keywords- Rotavator, Chickpea, Tillage, Yield Attributes.

Citation: Jain V. K., et al., (2017) Assessment of Tillage Operations on Yield Attributes of Chickpea. International Journal of Agriculture Sciences, ISSN: 0975-3710 & E-ISSN: 0975-9107, Volume 9, Issue 6, pp.-3816-3817.

Introduction

For improvement of agricultural productivity, besides high yielding varieties, fertilizer, irrigation and plant protection, timely preparation of seedbed using efficient implements is important. Proper seedbed preparation is a prerequisite for good crop stands, growth and yield. The light soil requires comparatively lesser tillage than heavier soils [1]. Nearly 70% of farmers in district use tractor for tillage and planting of dry lands crops. The cost and the timeliness of operation assume critical importance while deciding the type of tillage tools and operations to be carried out. Surface tillage farming systems, such as, those using the traditional tools like plough, cultivator, harrow and dutch foot cultivator are not very effective in mixing the stubbles of the preceding crop in the soil and seedbed preparation. The time between harvesting the first crop and sowing of the next crop is quite limited, keeping in view the tillage operations, irrigation and manpower availability. During the course of preparing a satisfactory seedbed for the next crop, the primary and secondary tillage operations require as many as 2 to 3 operations of the field cultivator and 1 to 2 planking. To minimize the time, cost and energy requirements for field operations, considerable attention is now being focused on the use of rotavator. Rotavator have greater versatility in manipulating the soil and reduce the time required to get an optimum seedbed by combining the primary and secondary tillage operations. This allows the farmer to increase his farm acreage which becomes less dependent on hired farm labour, performs operations more timely and obtains higher yields [2]. In a study conducted by [3] it was found that the degree of soil pulverization attained by the rotavator was comparable with the use of a mould board plough, and harrow (twice) and spiked tooth harrow. Hence, the rotary tilling machines, in principle are capable of replacing the conventional system of using passive soil working tools. The present study was under taken with a view to evaluate rotavator performance on the basis of seedbed preparation, crop response and economics as compared to other tillage systems in vertisols under chickpea crop farming system.

Materials and Methods

A 6-flange, 1.2 m wide rotavator was selected for the study. L-type blade was used and these blades were mounted on the fixed flanges of the rotavator. Field performance of rotavator was evaluated under vertisol of Ashoknagar for seed bed preparation in *rabi* seasons during the year 2011-12 and 2012-13. One pass of rotavator operation was carried out after the harvesting of soybean crop for seedbed preparation and various field performance parameters were recorded. The performance of rotavator for seedbed operation was compared with the performance of cultivator and dutch foot cultivator. The experiment was laid out in randomly block design with 7 replications; comprising three tillage treatments. A field size of 2000 m^2 was selected for each experiment. During the course of operation, different observations, such as, fuel consumption, and time taken were recorded. The chickpea variety vishal was sown, in all the plots, between 15 to 30 october in *rabi* season of each year with the help of seed -cum - ferti drill. Recommended doses of fertilizer, IPM, INM and other inputs were applied. Data on germination, No of nodules in root, plant height, no of pods, weight of pods per plant, weight of seeds per plant and yield were taken. Randomly selected 10 plants from each plot were taken to collect the data. Grain yield and straw yield were determined by harvesting an area of 1 sq m of the experimental plot separately expressed in q ha^{-1}. Data recorded for different parameters were analyzed using analysis of variance (ANOVA) technique for randomly block design and means were separated at 5% level of significance.

The treatments were as follows:

Tl: 1x Cultivator + 1x (Dutch Foot Cultivator + Clod Crusher)
T2:1 x Cultivator + 2x (Dutch Foot Cultivator + Clod Crusher)
T3: 1x Rotavator

Results and Discussions

Time period required for seedbed preparation were 5.23, 7.30 and 3.87 h/ha for

treatments T1, T2 and T3 respectively. The minimum time required was for treatment T3 (1x Rotavator) whereas the maximum time was for treatment T2 i.e. 1 x Cultivator + 2x (Dutch Foot Cultivator + Clod Crusher).

The time savings in tillage operations were recorded in treatment T3 over T2 and T1 were 46.97 and 25.9 percent, respectively. The analysis of variance revealed that treatments T3 differ significantly at 5 percent significance level from treatments T2 and T1.

The fuel consumption for various tillage treatments is given in [Table-1]. It is evident that minimum fuel consumption was for treatment T3. It is evident from data that the fuel consumption in operation of treatment T3 is 14.19 lit/ha. However it was 19.16 and 26.73 lit/ha in treatment T1 and treatment T2 respectively. The analysis of variance indicated that treatment T3 differed significantly with other treatments at 5% level of significance. These finding are also lined by [4].

Table-1 *Time required, Fuel Consumption, Growth, yield Attributes and Yield of Chickpea influenced by Tillage*

Treatments	Time Required (hr/ha)	Fuel Consumption (li/ha)	Plant height (cm)	Pods /plant (no)	Straw yield (kg/ha)	Biological yield (kg/ha)	Seed yield (kg/ha)
T1	5.23	19.16	40.2	54.79	12.43	24.26	11.83
T2	7.30	26.73	43.7	59.69	15.04	28.33	13.29
T3	3.87	14.19	46.7	67.03	18.60	33.79	15.19
SEm	0.058	0.203	0.146	0.221	0.173	0.187	0.067
CD at 5%	0.180	0.626	0.45	0.680	0.532	0.576	0.206

Growth of the chickpea in terms of plant height and straw yield varied significantly as per the analysis of variance. The data revealed that plant height was found higher (46.7 cm) in treatment T3 as compare to treatments T1 (40.2 cm) and T2 (43.7 cm). Straw yield also found 23.64% and 49.65% more in treatment T3 as compare to treatment T2 and treatment T1.

Seed yield was significantly influenced by the treatments of tillage because the yield attributes were significantly influenced due to tillage [Table-1]. These attributes were comparatively more in treatment T3 than treatments T1 and T2. The number of pods/plant was found 67.03 in treatment T3 while in treatment T1 and T2, it was 54.7 and 59.6 pods/plant respectively. [5] also reported same finding.

Yield performance of chickpea was comparatively better in treatment T3 it showed that yield was significantly influenced by tillage. Highest yield (15.19 qt/ha) was found in treatment T3 and lowest yield in treatment T1 (11.83 qt/ha) which is 28.4% lower. [6-8] also reported same results in Chickpea.

Cost of cultivation showed that among different tillage practices, treatment T2 required higher cost of cultivation (Rs 23200) it is due to two operation of dutch foot cultivator. But more gross return found in treatment T3 [Table-2] because higher yield in this practices. In case of net returns, treatment T3 gave higher net return 11440/ha and 6960 /ha than treatment T1 and treatment T2 and in case of benefit cost ratio, treatment T3 found 0.49 and 0.32 more B:C Ratio than treatment T1 and T2 respectively. This may be because of lower cost of cultivation and higher economic yield under treatment T3 in chickpea. Same finding are also reported by [9] in chickpea.

Table-2 *Effect of Tillage Practices in chickpea on Economy Return*

Treatments	Yield (q/ha)	Gross Expenditure (Rs/ha)	Gross Return (Rs/ha)	Net Returns (Rs/ha)	B:C Ratio
1	2	3	4	5	6
T1	11.83	22580	41400	18820	1.83
T2	13.29	23200	46500	23300	2.00
T3	15.19	22890	53150	30260	2.32

Acknowledgement : Author thankful to Rajmata Vijayaraje Scindia Krishi Vishwavidyalaya, Gwalior, 474002, Madhya Pradesh

Conflict of Interest: None declared

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