Int.J.Curr.Microbiol.App.Sci (2017) *6*(9): 1476-1488

International Journal of Current Microbiology and Applied Sciences
ISSN: 2319-7706 **Volume 6 Number 9 (2017) pp. 1476-1488**
Journal homepage: http://www.ijcmas.com

Original Research Article https://doi.org/10.20546/ijcmas.2017.609.180

An Impact of the Different Tillage and Conservation Farming on Plant Growth and Selected Features of Finger Millet (*Eleusine coracana* L.) at Bastar Plateau Zone of Chhattisgarh, India

Sudha Sidar[1], Ashwani Kumar Thakur[2*], Manish Kumar[1], Tejpal Chandrakar[1] and S.C. Mukherjee[1]

[1]SG College of Agriculture and Research Station, Jagdalpur (CG), IGKV, Raipur, Chhattisgarh, India
[2]College of Agriculture and Research Station, Jagdalpur (CG), India
*Corresponding author

A B S T R A C T

The experiment was laid out in split plot design with two factors namely, tillage practices and different conservation farming split with three replications. The treatment consisted of three tillage practices *viz.* T1- Conventional tillage, T2 –Minimum tillage and T_3 – Summer plouging and five conservation farming *viz.* C1-Opening conservation, C2-Intercropping with redgram, C3-Mulching, C4-Herbicide application, C5-Combination of all treatments (C_1+C_2+C_3+C_4). Observations of crops are analyzed in Split plot design having three replications. The result revealed that conventional tillage gave Growth parameter like- plant population, plant height, root length, dry matter accumulation and leaf area index, crop growth rate, relative growth rate and net assimilation ratio in different stages mostly remained unaffected due to tillage practices. Number of effective tillers, 50% flowering date, number of finger lets penicale^{-1} and length of finger was not affected significantly due to tillage during experimentation. Whereas, number of seeds per finger, test weight, grain yield ha^{-1}, stover yield and system productivity were recorded significantly highest in treatment summer plouging but harvest index was recorded significantly highest in minimum tillage. In case of Conservation farming system, finger millet recorded significantly higher growth parameter like – plant population, plant height, dry matter accumulation, LAI, CGR, RGR and NAR mostly affected in all combination of treatment practices, however combination of treatment recorded higher values. Number of finger lets penicale^{-1}, length of finger and number of seeds per finger was significantly highest in all combination of treatment C_5 except number of effective tillers was observed significantly higher in herbicide application treatment. Whereas, highest grains yield ha^{-1}, test weight, stover yield and system productivity were recorded significantly highest in all combination of treatment.

Keywords

Tillage, Mulch, Herbicides, System productivity.

Article Info

Accepted:
19 July 2017
Available Online:
10 September 2017

Introduction

Finger millet [*Eleusine coracana* (L.) Gaertn.] is a stable food crop for millions of people in the semi-arid region of the world, particularly in Africa and India, and especially those who live by subsistence farming. This crop is cultivated in a wide geographical zone ranging from Senegal, Nigeria, across eastern and southern Africa, through the Middle East and into tropical Asia. Finger millet [*Eleusine coracana* (L.) Gaertn.] is among the most cultivated millets and belongs to the genus *Elelusine*, in the *Chloridoidae* subfamily. It is a native African crop which is also extremely important in South Asia (India and Nepal). The crop is adapted to a wide range of environments and can be grown in variety of soils with medium or low water holding capacity, but requires rainfall of at least 800 mm per annum (Thakur *et al.,* 2016). Millets are also unique due to their short growing season. They can develop from planted seeds to mature, ready to harvest plants in as little as 65 days. This is important in heavily populated areas. When properly stored, whole millets will keep for two or more years (Michaelraj and Shanmugam, 2013). Finger millet seeds can be stored for a very long time without any treatment (Gowda *et al.,* 2015).

Millets are important food grain in the diets of a large section of population in India. Millets are important food grains in the diets of a large section of population in India. Millets are important food grains in the diets of a large section of population in India. Millets are important food for sustaining tribal population in Bastar region of Chhattisgarh. The important small cereals among tribes of Bastar region are kodo millet (*Paspalum scrobiculatum* L.) and finger millet [*Eleusine coracana* (L.) Gaertn.] After rice (Verma and Mishra, 2010). Finger millet (*Eleusine coracana*) is grown mostly in arid region of eastern and southern African, Indian and Nepal. The seeds of the crop can be stored for longer duration without any insect damage. Finger millet locally named as *ragi*, which is the third most important millet, next to sorghum and pearl millet. Finger millet is nutritionally rich crop as it contains high level of calcium, iron, and manganese and their straw is also an important livestock feed. The crop is low glycemic index and has no gluten (Singh and Goel, 2015). Finger millet (*Eleusine coracana* G.) crop is generally grown in the Konkan on the moderate hill slopes and uplands which are less fertile and productive where rice cultivation is not possible. To get higher yield of quality finger millet, new high yielding fertilizer responsive varieties should be adapted with proper nutrient management practices. The productivity is low due to late transplanting, faulty methods of cultivation and little or no use of fertilizers. The secret of boosting its yields mainly lies in suitable planting method and properly fertilizing the crop (Ahiwale *et al.*, 2013). The productivity of rainfed areas is still very low. The studies on cropping system shown that intercropping with specific plant geometry and selection of compatible crop with suitable varieties is profitable practice and to make proper use of available soil moisture and nutrients more efficiently and thus improving productivity of rainfed crops (Kujur *et al.,* 2010). Finger millet crop is grown during *Kharif* season on very shallow and light soil on sloppy lands under rainfed condition. Finger millet is grown as sole crop by transplanting as well as drilled method in sub-montane zone and ghat zone of Maharashtra. Intercropping is a potential system for maximizing crop production under rainfed condition in terms of space and time in subsistence farming situation (Mitra *et al.,* 2001).

Materials and Methods

The experiment was conducted at Instructional cum Research Farm, S.G. College of Agriculture and research station, Jagdalpur (C.G.) during *Kharif* season. The soil was sandy loam in texture, low in organic carbon (0.5%). available N (220 kg ha^{-1}), available phosphorus (12.99 kg ha^{-1}) and medium in available potassium (256 kg ha^{-1}) with soil reaction (pH 6.2). Olsen's method (Watanabe and Olsen, 1965), Neutral normal Ammonium Acetate extract using flame photometer (Hanway and Heidel, 1952) and Walkely and Black method (Jackson,1967) for the determination of available nitrogen (N), phosphorus (P_2O_5) potassium (K_2O) and organic carbon, respectively. The pH of experimental site was determined through 1:2.5 soil and water suspension method (Jackson, 1967). The experiment was laid out in a Split plot design by keeping Three tillage, *viz*. T_1-(Conventional Tillage), T_2- (Minimum Tillage) and T_3- (Summer ploughing) as a main plot and five conservation farming as a sub plot *i.e.* Opening conservation furrow (C_1), Intercropping of finger millet + Red gram (C_2), Mulching with crop residues (C_3), Weedicide (Pre emergence application of Isoproturon @ 0.5 kg *a.i.* $ha^{-1)}$ (C_4) and combination of all treatment $C_1+C_2+C_3+C_4$ (C_5) and was replicated three times. In conventional tillage experimental area was deep ploughed by MB plough and twice by cultivator and one rotavator, In minimum tillage experiment area was ploughed twice by cultivator only and in summer ploughing deep ploughing by MB plough and one pass cultivator before sowing. A Nitrogen, Phosphorus and potassium fertilizer was given @ 60 kg ha^{-1}, 40 kg ha^{-1} and 30 kg ha^{-1}, respectively at the time of sowing. $1/3^{rd}$ nitrogen was given as basal dose; remaining nitrogen was given during tillering stage ($1/3^{rd}$) and panicle initiation stage ($1/3^{rd}$).

Results and Discussion

Plant population (m^{-2})

The data pertaining to plant population of finger millet at different crop growth stage are given in table 1. The data reveals that at 15 DAS and at harvest plant population significantly higher in treatment T_3 (summer ploughing). At 30, 45, 60 and 90 DAS plant population did not found significantly affected due to tillage practices. Plant population might be due to summer ploughing makes soil well pulverized, loose and friable and allows good aeration and improves the germination percentage by breaking the clods in the soil. Kisic *et al.*, (2010) studied in crop yield and plant density under different tillage system found that the plant density was high under reduced tillage system. In case of conservation farming on finger millet significantly higher plant population was recorded in treatment C_4 (Herbicide application). It might be due to application of herbicide decreased crop-weed competition *i.e*. plant attained height, population and properly utilized the nutrient, moisture and solar radiation.

Plant height

The data pertaining to plant height of finger millet at different crop growth stage are given in table 2. The data reveals that plant height increased progressively with advancement of crop age and reached maximum at harvest. The increasing rate as plant height from active tillering stage to panicle initiation was more as compared to other crop growth stages. At 45, 60, 90 DAS and at harvest plant height recorded significantly taller plant in treatment T_3 (summer ploughing) which was at par with T_2 (Minimum tillage) at 90 DAS. At 15 and 30 DAS plant height did not found significantly affect due to tillage practices. Increased plant height with increases tillage may be due to decreases bulk density which increased proliferation of root for the uptake of nutrient as well as moisture.

This corroborate with the earlier findings of Mukherjee (2008), Bisen and Singh (2008) and Wasaya *et al.,* (2012). Ahmad (2007) reported that the maximum plant height resulted from minimum tillage. Tillage had an effective impact on the growth at plants, especially plant height (Abdalla, 2006). The different conservation farming system of finger millet significantly affected the plant height at all the growth stages. At 30, 45, 60, 90 DAS and at harvest, significantly taller plant was recorded in treatment C_5 (C_1+C_2+C_3+C_4) whereas, plant height was on par with C_4 (Herbicide application) at harvest. Plant height is an important growth characteristic that is associated with the productive potential of a plant in relation to biomass and grain yield. Tallest plant height was recorded in summer ploughing, it might be due to the least infestation weeds, disease and pest infestation and also good moisture holding capacity in the soil. Memon *et al.*, (2013) observed that the deep tillage treatment produced tallest plants, followed by conventional tillage treatment.

Dry matter (g plant^{-1})

The data on dry matter accumulation are presented in table 3. The findings revealed that at all the growth stages dry matter accumulation was found non-significantly affect due to the different tillage treatments. In conservation farming, treatment C_5 (C1+C2+C3+C4) recorded significantly highest dry matter accumulation at all the growth stages except at 15 DAS, but it was at par with C4 (Herbicide application) 30 DAS, whereas, at 15 DAS conservation farming could not produced significant effect of dry matter accumulation. Holland (2004 a), also noted that plant performance under minimum tillage in terms of plant height, dry matter and fresh weight was very low than plants under conventional tillage.

Leaf Area Index (LAI)

The data on leaf area index at different stage of crop growth are presented and depicted in table 4. Leaf area index was gradually increased and reached maximum at 90 DAS and declined after words at harvest. Variations in LAI owing to tillage methods were found non-significant at all the growth stage during experimentation. As regards to conservation farming, LAI was found significantly higher in treatment C5 (C1+C2+C3+C4) at all the growth stages but treatment C_4 (Herbicide application) was on par with C_5 (C1+C2+C3+C4) at 45 DAS. Leaf area index in an important parameter of growth analysis because it is a measure of number of leaves per unit area which is turn in directly involved in photosynthesis. It is established fact that photosynthesis is directly related to growth and development of the plant.

Rahman *et al.*, (2004) observed that deep ploughing resulted in higher LAI values as compared to the shallow ploughing by power tiller irrespective of the number of passes. The effect of tillage methods on leaf area index was recorded opposite value there for significant effect was founded at all the growth intervals and at harvest. In conservation farming, LAI was highest due to combined effect of different treatment like application of herbicide, mulch and intercropping.

Crop growth rate (g day^{-1} plant^{-1})

The data with regard to crop growth rate at different duration are given in table 5. As regard to tillage, CGR remained unaffected at all the crop growth stages. Among the conservation farming, treatment C_5 (C1+C2+C3+C4) recorded significantly higher CGR among all the treatment up to 90 DAS but it was on par with C_4 (Herbicide application) and C_3 (Mulching) at 30 DAS, C_4 (Herbicide application) at 30-60 DAS, at 60-90 DAS $C_{3,}$ $C_{2,}$ and C_1 respectively, whereas, CGR was found significantly highest at harvest in treatment C_1 (Opening conservation). Increase in CGR at early stage may be due to active participation of leaves in photosynthesis and less density of weed. The dry matter accumulation was also higher during that period (Table 5).

Table.1 Plant population of finger millet as influenced by different tillage and conservation farming

Treatment	Plant population (m^2)					
	15 DAS	**30 DAS**	**45 DAS**	**60 DAS**	**90 DAS**	**At harvest**
			Tillage method			
T1	49.00	36.80	35.80	34.80	33.80	32.80
T2	47.13	36.73	35.73	34.73	33.73	32.73
T3	49.53	37.80	34.80	34.80	34.80	34.80
SEm±	0.12	0.30	0.30	0.30	0.30	0.30
CD at 0.05	0.49	NS	NS	NS	NS	1.23
			Conservation farming			
C1	47.33	38.00	36.33	35.67	35.00	34.33
C2	41.79	26.67	25.00	24.33	23.67	23.00
C3	48.67	38.89	37.22	36.56	35.89	35.22
C4	51.33	40.00	38.33	37.67	37.00	36.33
C5	53.67	42.00	40.33	39.67	39.00	38.33
SEm±	0.54	0.47	0.47	0.47	0.47	0.47
CD at 0.05	1.60	1.37	1.37	1.37	1.37	1.37

T1: Conventional tillage, T2: Minimum tillage, T3: Summer ploughing, C1: Open conservation, C2: Intercropping (finger millet + redgram), C3: Mulching, C4: Herbicide application, C5: C1+C2+C3+C4

Table.2 Plant height of finger millet as influenced by different tillage and conservation farming

Treatment	Plant height (cm)					
	15 DAS	**30 DAS**	**45 DAS**	**60 DAS**	**90 DAS**	**At harvest**
			Tillage methods			
T1	11.24	23.33	43.66	77.04	112.13	117.67
T2	11.31	23.90	46.55	84.65	116.53	118.07
T3	13.03	25.63	49.97	86.92	117.74	122.02
SEm±	0.45	0.54	0.62	0.77	0.88	0.40
CD at 0.05	NS	NS	2.49	3.12	3.55	1.63
			Conservation farming			
C1	9.28	19.87	42.92	80.55	111.73	117.51
C2	10.08	21.26	41.71	80.66	112.91	117.67
C3	11.12	23.48	46.25	81.80	115.57	118.51
C4	13.39	25.47	49.28	84.02	116.80	119.50
C5	15.42	31.36	53.47	87.32	120.33	123.08
SEm±	0.48	0.77	0.65	0.75	1.25	0.53
CD at 0.05	1.41	2.25	1.91	2.20	3.66	1.55

T1: Conventional tillage, T2: Minimum tillage, T3: Summer ploughing, C1: Open conservation, C2: Intercropping (finger millet + redgram), C3: Mulching, C4: Herbicide application, C5: C1+C2+C3+C4

Table.3 Dry matter accumulation of finger millet as influenced by different tillage and conservation farming

Treatment	**Dry matter accumulation (g plant^{-1})**					
	15 DAS	**30 DAS**	**45 DAS**	**60 DAS**	**90 DAS**	**At harvest**
			Tillage methods			
T1	0.06	1.49	12.98	23.56	32.67	39.55
T2	0.06	1.41	15.54	25.58	35.42	42.86
T3	0.09	1.59	14.56	26.11	36.25	43.36
SEm±	0.02	0.06	1.17	0.65	0.83	1.10
CD at 0.05	NS	NS	NS	NS	NS	NS
			Conservation farming			
C1	0.06	0.95	11.27	20.97	29.85	35.83
C2	0.06	0.89	10.85	21.69	31.88	41.45
C3	0.09	1.77	13.39	25.32	34.42	43.01
C4	0.07	1.85	16.09	27.12	36.94	42.23
C5	0.06	2.00	20.18	30.30	40.82	47.09
SEm±	0.02	0.12	0.64	0.55	0.58	0.79
CD at 0.05	NS	0.35	1.86	1.63	1.69	2.33

T1: Conventional tillage, T2: Minimum tillage, T3: Summer ploughing, C1: Open conservation, C2: Intercropping (finger millet + redgram), C3: Mulching, C4: Herbicide application, C5: C1+C2+C3+C4

Table.4 Leaf area index of finger millet as influenced by different tillage and conservation farming

Treatment	**LAI**					
	15 DAS	30 DAS	45 DAS	60 DAS	90 DAS	At harvest
			Tillage method			
T1	0.014	0.068	0.544	0.919	1.638	0.799
T2	0.017	0.075	0.564	0.909	1.646	0.808
T3	0.016	0.079	0.479	0.960	1.669	0.727
SEm±	0.001	0.003	0.050	0.026	0.035	0.106
CD at 0.05	NS	NS	NS	NS	NS	NS
			Conservation farming			
C1	0.016	0.059	0.477	0.791	1.628	0.730
C2	0.015	0.059	0.592	0.836	1.425	0.669
C3	0.016	0.081	0.477	0.949	1.586	0.821
C4	0.016	0.081	0.534	0.969	1.734	0.752
C5	0.018	0.090	0.567	1.102	1.881	0.919
SEm±	0.001	0.006	0.035	0.033	0.044	0.049
CD at 0.05	NS	0.018	NS	0.098	0.129	0.143

T1: Conventional tillage, T2: Minimum tillage, T3: Summer ploughing, C1: Open conservation, C2: Intercropping (finger millet + redgram), C3: Mulching, C4: Herbicide application, C5: C1+C2+C3+C4

Table.5 Crop growth rate of finger millet as influenced by different tillage and conservation farming

Treatment	CGR (g day^{-1} $plant^{-1}$)				
	15 -30 DAS	**30-45 DAS**	**45-60 DAS**	**60-90 DAS**	**90 –At harvest**
			Tillage methods		
T1	0.093	0.232	0.521	0.311	0.283
T2	0.089	0.224	0.671	0.301	0.316
T3	0.101	0.319	0.555	0.346	0.262
SEm±	0.004	0.048	0.046	0.014	0.020
CD at 0.05	NS	NS	NS	NS	NS
			Conservation farming		
C1	0.058	0.172	0.363	0.262	0.334
C2	0.054	0.108	0.480	0.309	0.451
C3	0.111	0.218	0.560	0.403	0.250
C4	0.118	0.331	0.752	0.272	0.222
C5	0.129	0.462	0.757	0.351s	0.178
SEm±	0.008	0.036	0.054	0.029	0.024
CD at 0.05	0.024	0.104	0.160	0.085	0.070

T1: Conventional tillage, T2: Minimum tillage, T3: Summer ploughing, C1: Open conservation, C2: Intercropping (finger millet + redgram), C3: Mulching, C4: Herbicide application, C5: C1+C2+C3+C4

Table.6 Relative growth rate of finger millet as influenced by different tillage and conservation farming

Treatment	RGR (g $g^{-1}day^{-1}$ $plant^{-1}$)				
	15 -30 DAS	**30-45 DAS**	**45-60 DAS**	**60-90 DAS**	**90 –At harvest**
			Tillage method		
T1	0.093	0.031	0.032	0.010	0.005
T2	0.091	0.034	0.034	0.007	0.005
T3	0.087	0.040	0.024	0.009	0.004
SEm±	0.004	0.005	0.003	0.000	0.000
CD at 0.05	NS	NS	NS	NS	NS
			Conservation farming		
C1	0.082	0.033	0.030	0.009	0.009
C2	0.077	0.029	0.039	0.010	0.010
C3	0.096	0.032	0.030	0.010	0.002
C4	0.096	0.037	0.028	0.010	0.001
C5	0.101	0.044	0.023	0.008	0.000
SEm±	0.004	0.005	0.003	0.008	0.001
CD at 0.05	0.016	NS	0.009	NS	0.003

T1: Conventional tillage, T2: Minimum tillage, T3: Summer ploughing, C1: Open conservation, C2: Intercropping (finger millet + redgram), C3: Mulching, C4: Herbicide application, C5: C1+C2+C3+C4

Table.7 Net assimilation rate of finger millet as influenced by different tillage and conservation farming

Treatment	NAR (mg g^{-1} d^{-1})				
	30 DAS	45 DAS	60 DAS	90 DAS	at harvest
		Tillage method			
T1	0.0031	0.0039	0.0012	0.0003	0.0002
T2	0.0030	0.0042	0.0011	0.0003	0.0003
T3	0.0031	0.0043	0.0012	0.0003	0.0003
SEm±	0.0000	0.0001	0.0000	0.0003	0.0000
CD at 0.05	NS	NS	NS	NS	NS
		Conservation farming			
C1	0.0022	0.0039	0.0012	0.0003	0.0002
C2	0.0020	0.0039	0.0013	0.0003	0.0004
C3	0.0033	0.0042	0.0014	0.0003	0.0003
C4	0.0033	0.0042	0.0011	0.0003	0.0002
C5	0.0033	0.0048	0.0009	0.0003	0.0002
SEm±	0.0000	0.0000	0.0000	0.0003	0.0000
CD at 0.05	0.0010	NS	NS	NS	0.0001

T1: Conventional tillage, T2: Minimum tillage, T3: Summer ploughing, C1: Open conservation, C2: Intercropping (finger millet + redgram), C3: Mulching, C4: Herbicide application, C5: C1+C2+C3+C4

Table.8 Number of effective tillers, 50% Flowering, Length of Finger, Number of finger lets, Number of seeds of finger millet as influenced by different tillage and conservation farming

Treatment	**Number of effective tillers (m^{-2}) (m^2)**	**50% Flowering (Days)**	**Length of Finger (cm)**	**Number of finger lets penical^{-1}**	**Number of seeds finger^{-1}**
		Tillage Methods			
T1	88.80	68	8.20	7.87	1024
T2	94.40	69	8.41	8.17	1040
T3	93.60	70	8.71	7.95	1041
SEm±	1.74	0.30	0.16	0.80	4.00
CD at 0.05	NS	NS	NS	NS	14.36
		Conservation farming			
C1	88.00	69	7.72	7.54	1035
C2	88.00	68	8.06	7.67	1025
C3	94.67	68	8.46	8.00	1026
C4	96.67	69	8.96	8.30	1036
C5	64.00	70	9.02	8.46	1057
SEm±	1.74	0.72	0.12	0.10	6.58
CD at 0.05	5.10	NS	0.36	0.29	19.31

T1: Conventional tillage, T2: Minimum tillage, T3: Summer ploughing, C1: Open conservation, C2: Intercropping (finger millet + redgram), C3: Mulching, C4: Herbicide application, C5: C1+C2+C3+C4

Table.9 Test weight, Stover yield, Yield, HI finger millet as influenced by different tillage and conservation farming

Treatment	Test weight (g)	Stover yield (q ha^{-1})	Yield (q ha^{-1})	HI
		Tillage Methods		
T1	2.34	64.87	24.11	25.31
T2	2.42	72.10	26.09	29.35
T3	2.47	74.11	26.89	26.88
SEm±	0.01	1.73	0.89	0.59
CD at 0.05	0.05	6.95	0.44	2.38
		Conservation farming		
C1	2.26	70.75	22.91	24.70
C2	2.24	50.01	22.58	31.33
C3	2.35	76.39	25.39	25.12
C4	2.48	73.55	27.56	27.54
C5	2.72	81.11	30.03	27.22
SEm±	0.04	2.98	0.74	1.08
CD at 0.05	0.13	8.76	2.18	3.16

T1: Conventional tillage, T2: Minimum tillage, T3: Summer ploughing, C1: Open conservation, C2: Intercropping (finger millet + redgram), C3: Mulching, C4: Herbicide application, C5: C1+C2+C3+C4

Relative growth rate (g g^{-1} day^{-1} plant^{-1})

The RGR was calculated for the period between, 15-30, 30-45, 45-60, 60-90 and 90-at harvest and the data are given in table 6.

The findings revealed that different treatment of tillage are recorded almost similar values during experimentation in tillage system. As regard to conservation farming, RGR was recorded significantly higher in treatment C_5 (C1+C2+C3+C4) at 15-30 DAS which was at par with C_4 (Herbicide application) and C_3 (Mulching). At 45-60 DAS, treatment C_2 (Intercropping with redgram) recorded significantly higher RGR and it was on par with C_1 (Opening conservation) and C_3 (Mulching). Whereas, at 90 DAS-at harvest C_5 (C1+C2+C3+C4) recorded significantly highest relative growth rate (Table 6).

Net assimilation rate (mg g^{-1} day^{-1})

The NAR of finger millet as influenced by different treatment are given in table 7. The findings revealed that different treatment of tillage was recorded almost similar values of NAR during the experimentation in different tillage methods at different growth stages. In case of conservation farming, treatment C_5 (C1+C2+C3+C4) recorded significantly higher NAR among all the conservation farming treatment at 15-30 DAS and 90-at harvest, whereas, at 30-45 DAS, 45-60 DAS and 60-90 DAS it was produced almost similar values.

Number of effective tillers (m^2)

The data pertaining to effective tillers are presented in table 8. The findings showed that there was significant difference by different treatment during experimental year. Tillage methods were found non-significant effect but in general treatment T_2 (Minimum tillage) recorded numerically higher number of tillers per meter square. Conservation farming significantly affected number of tillers plant^{-1}. Number of effective tillers was observed significantly higher in treatment C_4 (Herbicide application) which was at par with C_3 (Mulching) and C_5 (C1+C2+C3+C4) than the other treatment. It might be due to combination of all treatment such as mulching and herbicide application to provide proper growth in plant. Mohammed *et al.,* (2011) found that the tillage depth, 15 cm gave the highest number of panicles per plot, greatest number of grains per panicle and highest grain yield. Tillering is very sensitive to water stress, being almost halved if conditions are dry enough. Holland (2004, b) reported that mulch cover shields the soil from solar radiation thereby reducing evaporation from the soil and also increased plant growth.

50% Flowering

The data presented in table 8 reveals that 50% flowering of finger millet was found non-significant effect due to tillage methods and conservation farming. It because the variety of finger millet was similar, so there was not shown any different character on finger millet.

Length of fingers (cm)

The data presented in table 8 reveals that length of finger was found non-significant effect due to tillage methods. Whereas, conservation farming treatment C_5 (C1+C2+C3+C4) recorded significantly higher length of finger per plant among the conservation farming but it was found equal to the treatment C_4 (Herbicide application). It might be due to mulch and herbicide treatments were less weed that is why finger millet used proper nutrient, moisture and less competition for the light.

Number of finger lets panicle^{-1}

The data presented in table 8 reveals that number of finger lets penicale^{-1} produced non-significant effect due to tillage methods. In case of conservation farming treatment C_5 (C1+C2+C3+C4) recorded significantly higher number of finger lets panicle^{-1} but it was found at par with treatment C_4 (Herbicide application). More number of finger lets per panicle may be due to taller plants having more tillers and herbicide treatments were less weed that is why finger millet used proper nutrient, moisture and less competition for the light.

Number of seeds finger^{-1}

Numbers of seeds per finger of finger millet as influenced by different treatments are presented in table 8. The data shows that the number of seeds per finger was recorded significantly higher in the treatment T_3 (summer ploughing) and lowest number of seeds was recorded in treatment T_1 (Conventional tillage). In case of conservation farming, treatment C_5 (C1+C2+C3+C4) recorded significantly highest number of seed per finger among all the other conservation farming. Number of seeds per finger may be due to taller plants having more tillers higher length of finger and herbicide treatments were less weed that is why finger millet used proper nutrient, moisture and less competition for the light.

1000-seed weight (g)

Thousand seed weight of finger millet was affected by different treatments and the data are given in table 9. Treatment T_3 (summer ploughing) produced significantly higher thousand seed weight which was on par with T_2 (minimum tillage) and lowest thousand seed weight recorded in treatment T_1 (Conventional tillage).Whereas, treatment C_5 produced highest thousand seed weight among all the treatment in conservation farming.

Stover yield and grain yield (q ha^{-1})

Data presented in table 9 reveals that stover yield and grain yield had significantly highest in treatment T_3 (summer ploughing) which was at par with treatment T_2 (Minimum tillage) in stover yield and lowest stover yield was recorded in treatment T_1 (Conventional tillage). Borin and Sartori (1996) reported that among conventional tillage, minimum tillage and no-tillage in maize growing the highest yield had been obtained with the conventional tillage.

Bhatt *et al.,* (2004) reported that minimum tilled plots produced higher dry matter as compared to +the conventionally tilled plots. He also observed that straw and grain yield was higher under minimum tillage as compared to conventional tillage treatment. In case of conservation farming, stover and grain yield had significantly highest in treatment C_5 (C_1+C_2+C_3+C_4) which as at par with treatment C_3 (Mulching) in stover yield. Samarajeewa *et al.,* (2006) observed that the use of cover crop must be justified economically by no herbicide input and increased yield.

The grain yield and straw yield redused considerably when intercropping with legume compared to sole crop of finger millet as reported by Singh and Arya (1999) and Mitra *et al.,* (2001).

Acquah (2002), who elaborated that supply of moisture at critical stages of growth results in higher yields. Prasad *et al.,* (1991) recorded that the weeds reduced yield of finger millet by 55-61 per cent and hand weeding twice gave the highest grain yield. Singh and Arya (1999) also noted similar findings.

Harvest index (HI)

Harvest index was significantly affected by different treatment (Table 8). The data reveals that T_2 (Minimum tillage) recorded significantly highest harvest index among tillage treatments. Whereas, in conservation farming treatment C_2 (Intercropping with redgram) recorded significantly highest harvest index among all the conservation farming and lowest harvest index was recorded in treatment C_1 (Opening conservation).

References

Abdalla, A. N., 2006. Effect of Tillage on soil Moisture storage of three Gardoud soils of North Kordofan State, Sudan. Ph.D. Thesis, University of Kordofan, Elobied, Sudan. pp 65-70.

Acquah, G., 2002. Principles of Crop Production, Second Edition. Prentice Hall Inc. India.

Ahilwale, P. H., Chavan, L.S., Jagtap, D.N., Mahadkar, U.V. and Gawde, M.B. 2013. Effects of establishment methods and nutrient management on yield attributes and yield of finger millet. Crop Res., 45(1, 2 & 3): 141-145.

Ahmad, T., Samara N. H. 2007.The effect of tillage practices on Barely production under rainfed conditions in Jordan. American Eurasian. *J. Agric. Environ. Sci.,* 2(1): 75-79.

Bisen, P. K., and Singh, R. 2008. Effect of tillage and weed growth and yield of wheat in rice – wheat system. *Ind. J. Agri. Sci.,* 78 (4): 347-350.

Borin, M., and Sartori, L. 1996. Barley, soybean and maize production using ridge tillage, no-tillage and conventional tillage in north-east Italy. *J. Agri. Eng. Res.,* 62: 229-236.

Bray, R.H. 1948. Requirements for successful soil test. *Soil Science,* 66: 83-89.

Gowda, P.H., Prasad, P.V., Sangamesh, V., Angadi, Rangappa, U.M. and Wagle, P.2015. Finger millet: An alternative crop for the southern high plains. *American J. Plant Sci.,* 6: 2686-2691.

Holland, J. M., 2004 b. The environmental consequences of adopting conservational tillage in Europe: reviewing the evidence. *Agricultural Ecosystem Environment,* 103, 1–25.

Holland, P., 2004 a. Conservation tillage for sustainable crop production system in Africa, p-45, IAE, Lusaka, Zambia.

Kisic, I., Basic, F., Birkas, M., Jurisic, A., Bicanic, V. 2010. Crop yield and plant density tillage system. *Agri. Conspectus Sci.,* 75(1): 1-7.

Kujur, S., Ahmed, S., Shrivastava, G.P. and Singh, C.S. 2010. Performance of pigeonpea (*Cajanas cajan*) intercropping as influenced by row ratios and duration of finger millet (*Eleusine coracana* L). *Ind. J. Agro.,* 55 (3): 209- 214.

Memon, S. Q., Mirjat, M.S., Mughal, A.Q. and Amjad, N. 2013. Effect on conventional and non-conventional tillage practices on maize production. *Pakistan J. Agri. Engin, and Vet. Sci.,* 29 (2): 155-163.

Michaelraj. S. J., and Shanmugam, A. 2013. A study on millets cultivation in Karur district of Tamilnadu. *Int. J. Manage. Res. Review,* 2(4): 2167-2179.

Mitra, S., Ghosh, D.C., Sundra, G. and Jana, P.K. 2001. Performance of intercropping legumes in finger millet at varying fertility levels. *Ind. J. Agron.,* 46(1): 38-44.

Mohamed, E., El Naim, A. M.; Ebeadallah, B. E., Khalid A. and Ibrahim, K. A. 2011. Effect of tillage and farm yard manure in yield and yield components of sorghum under rainfed. *International Journal of Current Research,* 3(6): 389-392.

Muhr, G.R., Datta, N.P., Subramoney, H., Leley, V.K. and Donahue, R.L. 1965. Soil testing in India. United States Agronomy for International development mission on India, New Delhi.

Mukherjee, D., 2008. Effect of tillage practices and fertility levels on the performance of wheat (*Triticum aestivum*) under mid hill condition of West Bengal. *Ind. Agri. Sci.* 78(12): 1038- 41.

Piper, C. S. 1967. Soil and plant analysis. Bombayl New Delhi, Asia publishing house. Pp. 30-38.

Prasad, T.V.R., Narasimha, N., Dwarakanath, N., Munegowda, M.K. and Krishnamurthy, K. 1991. Integrated weed management in drilled finger millet (*Eleusine coracana* (L.) Gaertn.). *Mysore J. Agri. Sci.,* 25(1): 13-17.

Rahman, M.S., Haque, M.A. and Salam, M.A. 2004. Effect of different tillage practices on growth, yield and yield contributing character of transplant among rice. *J. Agro,* 3(2): 103-110.

Samarajeewa, K.B.D.P., Horiuchi, T., Oba, S. 2006. Finger millet (*Eleucine corocana* L. Garetn) as a cover crop on weed control, growth and yield of soybean under different tillage systems, *Soil and Till. Res.,* 90: 93-99.

Singh, A.V., and Goel, R. 2015. Plant growth promoting efficiency of *Chryseobacterium* spp. per 10 on finger millet. *Bangldesh Agronomy J.,* 4: 2569-2575.

Singh, R.V., and Arya, M.P.S. 1999. Nitrogen requirement of finger millet + pulse intercropping system. *Ind. J. Agron.,* 44(1): 47-50.

Subbiah, B. V. and Asija, G. L. 1956. A rapid method for the estimation of nitrogen in soils. *Current Science,* 26: 259-260.

Thakur, A. K., Kumar, P., Salam, P., Patel, R. K. and Netam, C. R. 2016. Effect of different sowing methods, Nutrient Management and seed priming on growth, yield attributing characters, yield and economics of finger millet (*Eleucine coracana* L.) at Bastar Plateau. *J. Pure Appl. Microbiol.,* 10(1), 407-415.

Thakur, A. K., 2014. Productivity and economics of rice- based cropping system under different tillage, mulch and fertility level. Ph.D. Thesis I. G. K. V., Raipur (C.G.). Pp. 27-29.

Verma, P.K., and Mishra, N. 2010. Tradssitional techniques of processing on minor millets in Bastar district of

Chhattisgarh, India. *Res. J. Agricultural Science*, 1(4): 465- 467.

Wasaya, A., Tahir, M., Tanveer, A. and Yaseen, M. 2012. Response of maize to tillage and nitrogen management. *J. Animal and Plant Sci.*, 22(2): 452-456.

How to cite this article:

Sudha Sidar, Ashwani Kumar Thakur, Manish Kumar, Tejpal Chandrakar and Mukherjee, S.C. 2017. An Impact of the Different Tillage and Conservation Farming on Plant Growth and Selected Features of Finger Millet (*Eleusine coracana* L.) at Bastar Plateau Zone of Chhattisgarh, India. *Int.J.Curr.Microbiol.App.Sci.* 6(9): 1476-1488. doi: https://doi.org/10.20546/ijcmas.2017.609.180