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Study of Climate Change Effect on Sowing Dates for Chickpea after Paddy Crop in Eastern Vidarbha zone

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Abstract—*A study was carried out to find out suitable sowing dates for chickpea after paddy crop in Eastern Vidarbha zone in instructional Farm of Krishi Vigyan Kendra, Sonapur – Gadchiroli during 2011-12 to 2013-14. The experiment was laid out in randomized block design with four treatments of different sowing dates viz., 15 Nov., 30 Nov., 15 Dec. and 30 Dec., respectively replicated five times. The results of the experiments revealed that the Chickpea sown on 15 November and 30 November produced significantly higher pooled seed yield (1296 and 1253 kg ha^{-1}, respectively) over crop sown on 15 December (1102 kg ha^{-1}) and 30 December (932 kg ha^{-1}), respectively. The per cent yield reduction was observed in treatments of chickpea sown on 30 November (3.43 %), 15 December (17.60 %) and 30 December (39.05 %) over sowing date chickpea sown on 15 November, respectively. In terms of economics, treatments of chickpea sown on 15 November (T_1) and 30 November (T_2) were at par with each other and recorded significantly maximum gross monetary returns (Rs. 38868 and Rs. 37580 ha^{-1}, respectively) and net monetary returns (Rs. 22668 and 21380 ha^{-1}, respectively) over treatments of chickpea sown on 15 December (T_3) and 30 December (T_4), respectively. Treatment T_1 i.e. chickpea sown on 15 November recorded higher pooled B:C ratio of 2.40 followed by treatments T_2 (2.32), T_3 (2.04) and T_4 (1.73), respectively.*

Keywords: *Sowing dates, Paddy – Chickpea crop sequence, Economics*

1. INTRODUCTION

Rice (*Oryza sativa*) is the queen of cereals is of great importance and considered as a major cereal which can be viewed from the fact that, it occupies 11 % of world's crop area. India has about 45 million hectares of area and it produces on an average 95 million tons of rice. The total area under rice in the state is 15.47 lakh ha with an annual rice production of 28.33 lakh tones and average productivity is 1.83 tones ha^{-1}. There are major four regions of Maharashtra state i.e.

Vidarbha region, Marathwada, Konkan and Western Maharashtra where the rice crop is grown. Among these, Vidarbha region accounts 49.79 % area under rice with 11.47 lakh tones production and average productivity is 1.11 tones ha^{-1}. Mono cropping of rice is the principal activity of Gadchiroli region and it is being followed for several decades. Its economy is mainly rice based years together. Gadchiroli came under high rainfall zone and hence good availability of residual moisture gives opportunity to increase area under hardy rabi crops.

Chickpea is the premier hardy pulse crop of Indian subcontinent. India is the largest chickpea producer as well as consumer in the world. India grows chickpea on about 6.67 million ha producing 5.3 million tones which represents 30% and 38% of the national pulse acreage and production, respectively. In Maharashtra and in Vidarbha, area under chickpea is 10.51 and 3.98 lakh ha with 8.15 and 3.11 lakh tones production, respectively. The average productivity of Maharashtra and Vidarbha is 775 and 775 kg ha^{-1}, respectively. In Eastern Vidarbha zone, farmers preferred early (115-120 days) to mid late type (135-140 days) fine grain rice varieties.

To aware them in respect of sequence cropping with hardy crop like chickpea on residual moisture instead of mono cropping of rice is the prime object behind planning this experiment. In view of the above facts in mind, an experiment entitled " Standardization of sowing time for chickpea after paddy crop in Eastern Vidarbha zone " was planned with following objective; To find out optimum time for sowing of chickpea for higher productivity in Eastern Vidarbha zone

2. MATERIAL AND METHODS

A field experiment to Study of climate change effect on sowing dates for chickpea after paddy crop in Eastern Vidarbha zone conducted during Kharif – Rabi season of 2011-12, 2012-13 and 2013-14 at instructional Farm of Krishi Vigyan Kendra, Sonapur – Gadchiroli, Dr. Panjabrao Deshmukh Krishi Vidyapeeth, Akola (M.S.), India to find out the suitable sowing dates for chickpea after paddy crop in Eastern Vidarbha zone. The experiment was laid out in

randomized block design with four treatments of different sowing dates viz., T1 : 15 Nov., T2 : 30 Nov., T3 : 15 Dec. and T4 : 30 Dec., respectively replicated five times. Paddy variety Sindewahi 1 and Chickpea variety Jaki 9218 with recommended seed rate of was sown with recommended row spacing with proposed treatments of sowing dates. A recommended dose of fertilizer was applied to both the crops. All recommended package of practices were followed for cultivation. Observations on growth and yield attributes and yield, growing degree days temperature were recorded periodically.

3. RESULT AND DISCUSSION

The mean data of three years on grain yield, straw yield and monetary returns and B:C ratio of paddy presented in Table 1 indicated that the mean general paddy grain yield harvested was 3497 kg ha^{-1}, straw yield (4255 kg ha^{-1}), gross monetary returns (Rs. 47499 ha^{-1}), net monetary returns (Rs. 24075 ha^{-1}) along with B:C ratio (2.02).

Table 1: Mean ancillary characters, yield and economics of paddy (Avg. of 03 years)

Plant height (cm)	No. of tillers/hill	No. of effective tillers/hill	Panicle length (cm)	No. of grains/panicle	Seed yield /hill (g)	Test weight (g)	Yield (kg ha-1)		Monetary returns (Rs. ha-1)		B:C ratio
							Grain	Straw	GMR	NMR	
103.67	16.65	13.38	19.80	104.00	14.43	13.86	3497	4255	47499	24075	2.02

Table 2: Mean growth and yield attributing characters of chickpea as influenced by different sowing dates (Avg. of 03 years)

Treatments	Growth attributes			Yield attributes		
	Plant height (cm)	No. Branches plant-1		No. Pods plant-1	Seed yield plant-1 (g)	Test weight (g)
		Prim.	Sec.			
T1 - 15 Nov.	32.36	3.36	12.05	16.08	6.43	19.63
T2 - 30 Nov.	32.60	3.18	11.75	15.97	6.41	19.66
T3 - 15 Dec.	31.48	3.26	10.66	14.71	5.79	19.45
T4 - 30 Dec.	30.55	2.91	10.45	13.38	5.29	19.37
SE(m) ±	0.80	0.24	0.74	0.54	0.22	0.23
CD at 5 %	NS	NS	NS	1.67	0.66	NS
GM	31.75	3.18	11.23	15.04	5.98	19.53

The data presented in Table 2 revealed that the chickpea sown on 15 November and 30 November were at par with each other and recorded significantly higher mean number of pods per plant (16.08 and 15.97, respectively) and mean seed yield per plant (6.43 and 6.41 g, respectively) over sowing dates T_3 and T_4, respectively.

Table 3: Mean growing degree days (day ^{0}C), land use efficiency (%) and heat use efficiency (kg/ha/day ^{0}C) of chickpea after paddy as influenced by different treatments.

Treatments	Growing degree days (day oC)		Land use efficiency of system (%)	Heat use efficiency (kg/ha/day 0C)
	50 % flowering	Maturity		
T1 - 15 Nov.	939	1659	61.83	0.79
T2 - 30 Nov.	898	1636	61.05	0.78
T3 - 15 Dec.	829	1541	59.12	0.72
T4 - 30 Dec.	811	1505	57.30	0.62

It was clear from data presented in Table 3 that the chickpea sown on 15 November (T_1) availed the highest mean growing degree days as 939 day ^{o}C up to 50 % flowering and 1659 day ^{o}C up to maturity followed by sowing dates T_2, T_3 and T_4, respectively. However, sowing date 15 November observed maximum mean land use efficiency (61.83 %) closely followed by 30 November (61.05 %), 15 December (59.12 %). However, treatment T_4 recorded lowest land use efficiency (57.30 %). Similar research trend was observed in respect of heat use efficiency of the chickpea.

Table 4: Pooled seed yield (kg ha^{-1}) of chickpea as influenced by different sowing date treatments

Treatments	Seed yield (kg ha-1)			Pooled seed yield (kg ha-1)	% decrease in yield
	2011-12	2012-13	2013-14		
T1 - 15 Nov.	1341	1180	1368	1296	-
T2 - 30 Nov.	1255	1068	1435	1253	3.43
T3 - 15 Dec.	1175	972	1160	1102	17.60
T4 - 30 Dec.	967	885	945	932	39.05
SE(m) ±	43	40	49	22.51	-
CD at 5 %	131	124	149	69.35	-
GM	1185	1026	1227	1146	-
CV (%)	8.02	8.80	9.42	7.61	-

Three years pooled result of seed yield of chickpea presented in Table 4 revealed that the chickpea sown on 15 November (T_1) and 30 November (T_2) were at par with each other and

recorded significantly higher pooled seed yield (1296 and 1253 kg ha^{-1}) over crop sown on 15 December (1102 kg ha^{-1}) and 30 December (932 kg ha^{-1}), respectively. The above results are in line of the findings of Kulkarni and Chimmad (2014), Chand Mukesh et al., (2010), Srinivasan et al., (1998) in Chick pea. The per cent yield reduction was observed in treatments of chickpea sown on 30 November (3.43 %), 15 December (17.60 %) and 30 December (39.05 %) over sowing date chickpea sown on 15 November, respectively.

Table 5: Pooled gross, net monetary returns and B:C ratio of chickpea as influenced by different treatments

Treatments	Pooled seed yield (kg ha-1)	Pooled monetary returns (Rs. ha-1)		Pooled B:C ratio
		Gross	Net	
T1 - 15 Nov.	1296	38868	22668	2.40
T2 - 30 Nov.	1253	37580	21380	2.32
T3 - 15 Dec.	1102	33070	16870	2.04
T4 - 30 Dec.	932	27974	11774	1.73
SE(m) ±	22.51	675	675	-
CD at 5 %	69.35	2081	2081	-
GM	1146	34373	18173	2.12

Note: COC: Rs. 16200 ha^{-1} and Selling rate: Rs. 3000 q^{-1}.

Pooled data of three years experimentation depicted in Table 5 indicated that the various sowing dates shown significant difference on productivity and monetary returns of chickpea sown after paddy crop. The chickpea sown on 15 November (T_1) and 30 November (T_2) were at par with each other and recorded significantly maximum gross monetary returns (Rs. 38868 and Rs. 37580 ha^{-1}, respectively), net monetary returns (Rs. 22668 and 21380 ha^{-1}, respectively) over chickpea sown on 15 December and 30 December, respectively. Similar results of effect of sowing dates on economics of chickpea are reported by Chand Mukesh et al., (2010) and Srinivasan et al., (1998). Treatment T_1 i.e. chickpea sown on 15 November recorded higher pooled B:C ratio of 2.40 followed by treatments T_2 (2.32), T_3 (2.04) and T_4 (1.73), respectively.

4. CONCLUSIONS

On the basis of three years of the experimentation, the conclusions are drawn and summarized as; 1. Chickpea sown on 15 November and 30 November produced significantly higher pooled seed yield (1296 and 1253 kg ha^{-1}, respectively) over crop sown on 15 December (1102 kg ha^{-1}) and 30 December (932 kg ha^{-1}), respectively. 2. Treatments of chickpea sown on 15 November (T_1) and 30 November (T_2) were at par with each other and recorded significantly maximum gross monetary returns (Rs. 38868 and Rs. 37580 ha^{-1}, respectively) and net monetary returns (Rs. 22668 and 21380 ha^{-1}, respectively) over treatments of chickpea sown on 15 December (T_3) and 30 December (T_4), respectively.

5. RECOMMENDATION

In Eastern Vidarbha zone for obtaining higher productivity of chickpea under paddy – chickpea crop sequence, chickpea sowing should be done from 15 November to 30 November is recommended, the subsequent delay in sowing date up to 15 December shall result in to reduce yield by 17.60 % and up to 30 December shall result in to reduce yield by 39.05 %.

6. LITERATURE CITED

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