



## Enhancing Water Productivity to Improve Chickpea Production in Bansagar Command Area of Madhya Pradesh

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### ABSTRACT

To improve chickpea production and to enhance water productivity in Bansagar command area of Madhya Pradesh, four water management treatments consisting two farmers practices treatments i.e. two irrigation by flooding method and two improved practices i.e. two irrigation at flowering and pod formation stage with border strip method were studied. Under improved practices water was applied twice each of 4 cm depth at flowering and pod formation stages by boarder strip method. It was recorded that improved irrigation management practices gave significantly higher number of nodules (119/plant), and seed yield (1237Kg/ha) of chickpea. An increase of 11.32% chickpea yield was noticed as compared to farmers practices. Water expenses efficiency (water productivity) was also found better in improved practice (98.2 Kg/ha/cm) as compared to farmers practices (49.8 Kg/ha/cm) as total 15 cm irrigation water was applied produced 1042 kg/ha yield of chickpea under farmers practices.

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Chickpea (*Cicer arietinum* L) is not only an important pulse crop of India but it also occupies considerable area in the Madhya Pradesh especially in North Eastern part of the state. It is cultivated during Rabi season. The productivity of chickpea in this region is only 975 kg/ha besides having good resources. The low productivity is mainly due to water stress at growth stages and untimely irrigation by farmers (Singh *et al* 2013). Irrigation plays an important role in increasing productivity of the crop. Water is an immediate necessity to resort to newer methods of water application at farmers fields which result maximum irrigation efficiency in comparison to continuous and intermittent modes of border irrigation, it also resulted the increased bulk density of soil. This was confirmed in a research experiment conducted at M.P. water & resources project Bhopal at different location in M.P. state during the years 2005 to onwards for increasing irrigation efficiency. Border method

consists of water application in fields through long parallel strips having sufficient widths (based on soil type and slopes). There are three modes of water application of border irrigation method namely continuous mode, intermittent mode and surge mode. The focus is being emphasized here over surge mode of water application.

### MATERIALS AND METHODS

A field experiment conducted during 2011 and 2012 at farmers field under MPWSRP project. The soil of the experimental field was Alfisols with pH 7.3, organic carbon 0.32%, sand 31.2% silt 39.4% and clay 29.4% The available soil N, P<sub>2</sub>O<sub>5</sub> and K<sub>2</sub>O were 183 Kg/ha, 11.6kg/ha and 257 Kg/ha respectively. The chickpea variety JG-11 was grown with a row spacing of 25 cm. in the last week of October. To demonstrate the potential of improved water impact of technology and to have sustained impact of technology, field demonstrations were conducted at five farmers fields in Govindgarh command area of Bansagar.

Using border strip irrigation chickpea was cultivated in two ways – (i) farmer's practices (flood

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irrigation) and improved practices (critical stages irrigation). Kay in 1990 and Purkey *et. al.* in 1989 has recommended surge flow irrigation for

recession columns. The physico-chemical properties of soil has been shown in table 1.

**Table 1:** Physico-chemical properties of soil :

S.N.	Particulars	Soil type	
		Bhata	Matasi
1	pH	7.0-7.3	7.1-7.2
2	Electrical conductivity (dS/m)	0.24	0.27
3	Organic carbon (%)	0.29	0.34
4	Available nutrients (kg/ha)		
	a. Nitrogen (N)	197.00	188.01
	b. Phosphorus (P <sub>2</sub> O <sub>5</sub> )	10.42	4.00
	c. Potash (K <sub>2</sub> O)	96.00	133.10
5	Colour	Red	Yellow
6	Mechanical composition (%)		
	Sand	30.60	32.90
	Silt	38.70	40.20
	Clay	30.70	26.90
7	Texture	Sandy loam	Silty Loam

light irrigation. Smaller depths of irrigation can be achieved with smaller flow rates only through surge treatment not through continuous flow. Thus, it can be used for shallow rooted crops as well as for pre-sowing irrigations during early

## RESULTS AND DISCUSSION

Methods of application of irrigation in chickpea production was enhanced following attributing character.

**Table 2 :** Irrigation application method and its effect on yield of Chickpea

Method of practices	Yield (kg/ha)	Avg. No. of Nodules/plant	Water Expense Efficiency (kg/ha/cm)	Irrigation Depth (cm)	Yield Increase over farmers practice
Farmers practices	1063	90.63	52.8	6.2	-
Improve practices	1398	119.91	82.4	14.9	31.26
—	1231	105.27	76.6	10.55	

vegetative growth. The experiment conducted by Levin et al (5) in 1977 reported the effects of continuous and intermittent application of water over the soil in terms of wetting front advance, cumulative infiltration, infiltration rate and soil moisture content in horizontal and vertical

## Water Expense Efficiency

Water expense efficiency (kg/ha/cm) was found to be maximum in improved practices at critical stages of chickpea 82.4 in comparison to farmers practices only 52.8. Moisture retention capacity

**Table 3 :** Economics of Irrigation practice of Chickpea Production

Methods of practices	Gross return (Rs /ha)	Cost of cultivation (Rs /ha)	Net return (Rs /ha)	B:C Ratio
Farmers practice	31950	8840	23110	2.61
Improved practice	41940	10560	31380	2.97

and nutrient uptake capacity also increase at critical stages of improved practices resulting in improved seed yield.

#### **Yield and Yield attributing characters**

Highest average yield of chickpea was recorded in case of improved practices (1231 kg /ha) over farmer practices (1063 kg/ha). Improving no. of nodules formation and soil health also significantly increase in improved practices over farmer's practices. Patel *et al* (2002) reported nodulation is directly correlated to enhancing productivity of pulses crop and sustaining micro biological properties of vertisols. In improved practices the yield and no. of nodules of chickpea increased over farmers practices 31.26% and 32.2% respectively. The water expense efficiency was also increased in improved practices (56.06%) over farmer's practices.

#### **Economic Return**

The inputs and outputs prices of commodities prevailed during the study of demonstrations were taken for calculating gross return, cost of cultivation, net return and benefit: cost ratio (Table 3). The cultivation of chick pea gave higher gross income, net return as well as benefit: cost ratio of Rs. 41,940, 31,380 and 2.97 respectively under improved cultivation practices as compared to farmers practice. This may be due to higher yield obtained under improved technologies compared to local check (farmers practice).

#### **CONCLUSION**

It is concluded that an increase of 11.32% chickpea yield was noticed as compared to farmers practices. Water expenses efficiency (water productivity) was also found better in improved practice (98.2 Kg/ha/cm) as compared to farmers practices (49.8 Kg/ha/cm) as total 15 cm irrigation water was applied produced 1042 kg/ha yield of chickpea under farmers practices.

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