Journal of Pharmacognosy and Phytochemistry
Available online at www.phytojournal.com

E-ISSN: 2278-4136
P-ISSN: 2349-8234
JPP 2018; SP2: 315-318

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National Conference on Conservation Agriculture
(ITM University, Gwalior on 22-23 February, 2018)

Effect of variable irrigation methods, planting methods, seedling size on production efficency and economic returns of onion on marginal farmers of Tuta village, Raipur (Chhattisgarh)

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Abstract
An exploratory study was conducted on marginal farmer of Tuta Village, Raipur district of Chhattisgarh during the Rabi season 2016-17 to examine the effect of different irrigation methods, planting methods, size of seedling on the production efficiency evaluating the economic returns of marketable yield of Onion (*Allium cepa* L.). The study was conducted on the judgmental sampling of sampling size (N=80) farmers. The R x R and P x P spacing of 30 x 15 cm were taken with a variable seedling length of (15-30 cm) i.e. (30-45) DAS. The study revealed that highest yield of 28.5 t ha^{-1} was recorded with a bulb size of 36 mm although the total cost of production increased considerably with increase in levels of irrigation and moving from surface to subsurface irrigation methods. The total cost of production varied from 87956.21 Rs/ha to 93563.31 Rs ha^{-1}.
The overall result revealed that irrigation method and planting method has considerable influence on the yield. B:C Ratio varied from 9.36-13.47 (Rs ha^{-1}). The study was intended to infer that the marginal farmer can adopt furrow method of irrigation as compared to other irrigation method on the initial cost of cultivation in drip irrigation (substance) was much higher. This will boast the household income of the marginal farmer improving their standard of living.

Keywords: furrow, onion, b: c ratio, yield, attributes

Introduction
India is the world's second largest producer of vegetables next only to China. Important vegetable crops grown in the country are tomato, onion, Brinjal, Cabbage, Cauliflower, Okra and Onions. Onion is one of the most popular vegetable that form of daily diet. In India, onion an important commercial crop. It is widely grown is different parts of the country. Vegetables being the labour-intensive crops, have incurred significantly high costs on human labour. Gross returns as well as net returns per hectare have been observed to be highest for tomato, followed by cauliflower, cabbage and peas. The present exploratory study was undertaken to study returns of Onion and effect of variable irrigation methods planting methods seedling size on production efficiency. Indian onions are famous for their pungency and are available round the year. At least 175 countries grow onions. It is used either in raw form and dehydrated form to add flavor and taste to Indian cousins. Since onion has medicinal value, it is used in some pharmaceutical preparation also. It has many uses as, folk remedies and recent report suggests that onion play a part in preventing heart diseases and other ailments. Onion bulb is rich in minerals like phosphorous, calcium and carbohydrate. It also contains proteins and vitamin C.

Material and Methods
The study was conducted in Tuta Village of Raipur district of Chhattisgarh. The selection of district and tehsils was based on judgental criteria. Judgmental sampling procedure was adopted for the selection of villages and onion cultivation. A sample of a village was selected for the study of onion cultivation. Further, it was decided to select a sample of 80 onion respondents from the selected onion growing village. The primary data were collected by survey method with the help of pretested schedule of questionnaire through personal interview. The required primary data pertaining to cost, yield, prices and expenditure for the year 2016-17 were collected from selected onion growers. Cost and return per hectare of onion

production Cost of production means the expenses incurred per unit of output. The items of cost that go into the cost of production are both fixed cost remains fixed in the short run. The major items cost of cultivation were seeds, hired human labour, manures, bullock charges, fertilizer and rental value of land. The gross return was calculated on the basis of market price of the produce at the time when the produce is ready for sale. Net returns Rs./ha. was calculated by deducting the cost of cultivation from the gross income.

The region experiences sub tropical region with extremely hot during summer and cold during winter. The annual average temp is 18.7 ºC and annual overage total precipitation is 700 mm. Rainfall during crop cropping season was recorded as 62.5 mm. The soil in the research field are deep, medium, textured and well drained. The treatment consisted of 2 methods of growing crop (drip beds and bed furrows) and these level of irrigation i.e. in furrows beds irrigation was done at IW PAN-E ratio of 1.2, 1.6 and 2.0 whereas in case of drip beds, irrigation was applied at IW/PAN-E of 0.3, 0.4, 0.5. Irrigation depth was kept constant i.e., 30, 40 and 60 cm in case of drip and furrow. The Nursery of onion was sown in last week of October, Nursery land received decomposed farmyard manure (125 kg/200 m^2), was irrigated 10days before sowing of nursery to allow complete germination of weeds. The lands was ploughed and leveled. Seeds (10 kg/ha) were sown on raised bed of 15 cm height in rows 5 cm apart. Nursery bed were irrigated immediately after sowing and later as and when required. Prior to establishment of onion the soil was formed into beds or plots. The 30-45 days old onion seedling var N-2 Red were transplanted in the first week of January with a spacing of 30 cm x 15 cm in flat sown onions. Whereas, beds were 30 cm wide on which three onions rows were planted at 15 cm distance from row to row. Drip laterals were placed in the center of the bed. Nitrogen, Phosphorus and K/ha were applied @ 100 kg N and 50 kg P_2O_5 and 50 K_2O. The sources of N, P and K were Urea, DAP and NOP respectively. The entire quantity of P and K with one half of N were applied as basal dose at the time of the land preparation and the remaining half N was applied as top dresses. All other agronomic practices were kept uniform for all treatments. Onions are ready for harvest when the leaves collapse. The crop was harvested in the last week of May.

Analytical Tools

Cost of cultivation

The cost of cultivation of vegetables crops was worked out by using various cost concepts defined below:

Cost A1: It includes –

1. Value of hired human labour
2. Value of hired and owned bullock labour
3. Value of hired and owned machine labour
4. Value of seed
5. Value of manures (owned and purchased) and fertilizers
6. Depreciation
7. Irrigation charges
8. Land revenue
9. Interest on working capital
10. Miscellaneous expanses

Cost A2: Cost A1 + rent paid for leased-in land
Cost B1: Cost A1 + interest on fixed capital (excluding land)
Cost B2: Cost B1 + rental value of owned land + rent for leased-in land
Cost C1: Cost B1 + imputed value of family labour
Cost C2: Cost B2 + imputed value of family labour
Cost C3: Cost C2 + 10 per cent of cost C2 as management cost.

Cost of production: The cost of production was worked by using following formula:
Cost of production/qt = Cost of cultivation/ha Quantity of main product/ha

Income measures: Following income measures were calculated –

(i)Gross income: GI:
(Q × P)
Where, GI = Gross income Q = Quantity of main product P = Price of main product

(ii) Returns over variable cost (RVC):
RVC = Gross income – Cost A1

(iii) Farm business income (FBI):
FBI = Gross income – Cost A2

(iv) Family labour income (FLI):
FLI = Gross income – Cost B2

(v) Net income (NI):
NI = Gross income – Cost C2

(vi) Returns to management:
RM = Gross income – Cost C3

Result and Discussion

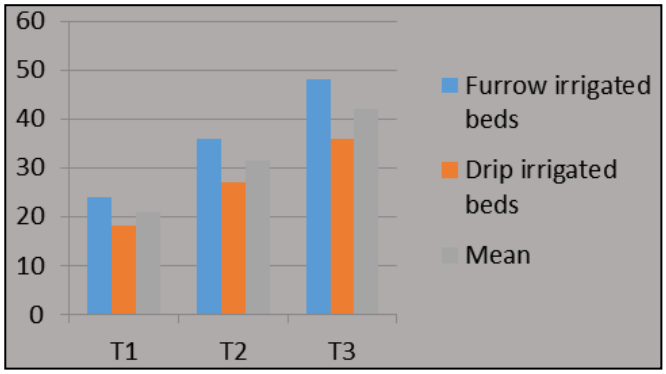
A common irrigation was applied to help establishing the onion seedlings in all plots irrespective of different irrigation treatments. Subsequently, the irrigation water was delivered through drip and furrow methods of irrigation, as per treatments. The amounts of water applied for different levels of drip irrigation and bed furrow was presented in table 1.0 Irrespective of irigation level treatments, minimum irrigation water was applied in drip irrigation (27 cm) followed by bed furrows (36 cm). Under drip irrigation beds 9, 18, 27 and 36 cm of water was applied for maintaining IW/PAN-E ratios of 0.3, 0.4 and 0.5 respectively (Table 2). Similarly 24, 36 and 48 on water was applied under bed furrow onions at 1.2, 1.6 and 2.0 IW/PAN-E ration respectively. However, irrespective of planting methods max. mean application of irrigation water was observed under T_3 treatment i.e. 52 cm followed by 12 (39 cm) and least under 11 (26 cm) treatments. Drip irrigation has the potential to apply water frequently and uniformly to the onion seed row to an onion bed without using the soil between onion beds. Halvors on *et al.* (2008) [2] observed that onions under drip irrigation were irrigated 20 times during the growing season with a total gross water application of 87.9 cm, while the onions under furrow irrigation received a total gross water application 243.8 cm using 13 irrigations. Approximately 82.3 cm of the water applied ran off the end of the field in the furrow irrigated system in 2005 and 62.0 cm in 2006. Reddy *et al* (2012) [3] reported 300 mm use of irrigation water under furrow irrigation as compare to 134.5 order drip irrigation, thus saving of 55% irrigation water observed under drip irrigation. This may be attributed due to the fact that maximum amount of water applied was stored in the root zone in case of drip irrigation treatments, with minimum deep percolation losses.

Table 1: Metrological data for the experimental year (2016)

Months	Avg. Temp (ºC)		Avg. Sunshine (hrs.)	Avg. winds speed (m/s)	Total Exploration	Total Rainfall
	Max.	Min.				
Jan.	16.9	5.6	5.6	3.4	52.6	14.0
Feb.	19.9	6.7	6.9	4.3	70.2	4.6
March	27.3	11.6	7.8	4.3	137.0	38.6
April	33.8	18.1	8.5	4.7	173.9	1.6
May	39.6	22.6	9.7	5.2	298.9	3.5

Table 2: Amount of irrigation water (cm) applied in each method. Methods of irrigation levels

	T_1	T_2	T_3	Mean
Furrow irrigated beds	24	36	48	36
Drip irrigated beds	18	27	36	27
Mean	21	31.5	42	



Onion grade size and yield

The grade size of onion bulbs was significant affected by planting method (Table 3) between two planting methods, drip irrigated bed onions had larger bulb diameter than furrow irrigated beds onions. (Table 3) The percentage of onion grade size of 20, 30, 90 & 50 mm. were observed to be 7.6, 18.8, 34.1 and 39.5 respectively.

The furrow irrigated beds showed in between values. Irrespective of planting methods, the percentage of onion grade size of 20, 30, 40 and 50 mm were observed to be 10.4, 22.6, 31.5 and 35.5 respectively. Similar to grade size, onion yield was also observed significantly affected by planting methods & irrigation levels. Irrespective of irrigation level treatments, Onion yield was observed in furrow irrigation beds (20.5 t/ha) and highest onion yield was recorded under drip irrigated beds (28.5 t/ha)

Table 3: Effect of different irrigation methods and levels of onion grade size (mm)

Method of irrigation	Onion grade size			
	T_1	T_2	T_3	T_4
Furrow irrigated beds	8.7	23.9	31.8	35.6
Drip irrigated beds	7.6	18.8	34.1	39.5
Mean	12.5	33.3	48.85	

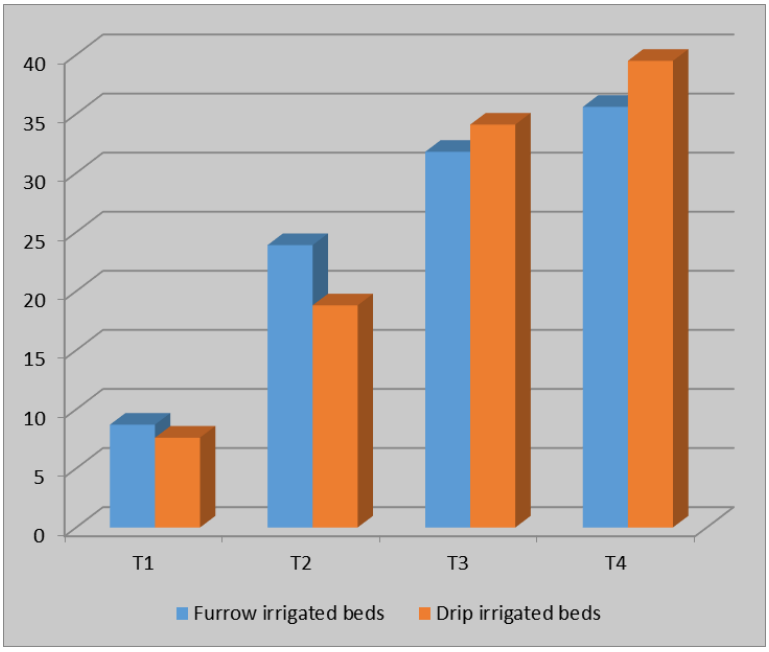
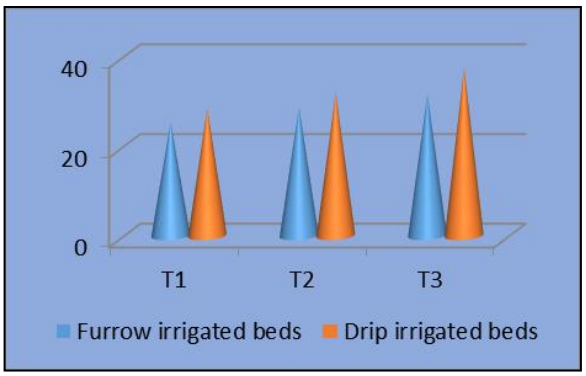


Table 4: Effect of irrigation methods and levels on onion production (t/ha)

Method of irrigation	Irrigation Level			
	T_1	T_2	T_3	Mean
Furrow irrigated beds	25.3	28.7	31.5	64.5
Drip irrigated beds	28.4	31.8	37.4	32.53
Mean	26.05	44.6	50.2	88.18



Onion Quality

Onion quality parameters ie. TSS was observed to be significantly affected either by the planting configuration and irrigation levels either irrespective of irrigation levels, TSS was observed to 10.8 and 11.3 respectively under furrow irrigated beds and drip irrigated beds. Under drip irrigated beds, 11.3, 10.9 and 11.8 of TSS value was recorded for IW/PAN-E ratios of 0.3, 0.4 and 0.5 respectively (Table 5). Similarly 10.2, 11.5 and 10.7 TSS was observed under bed furrow irrigation onions. However, irrespective of planting method max. mean TSS was oberved under T3 treatments and T2 ie. 11.2 followed by 11 (10.75). Kumar *et al* (2007) and Enciso *et al* (2009) [1] found that irrigation highly affected the total onion yield, yield components and morphological characteristics of onion bulbs, but did not affect the level of soluble solids in bulbs.

Table 5: Effect of irrigation methods and levels on onion quality (TSS)

Method of irrigation	Irrigation Levels			
	T_1	T_2	T_3	Mean
Furrow irrigated beds	10.2	11.5	10.7	10.8
Drip irrigated beds	11.3	10.9	11.8	11.3
Mean	10.75	11.2	11.25	

Economic Returns

Table 6: Economic returns of Onion

Seedling Length(cm)	Total Cost of Production (Rs/Ha)		Net Returns(Rs/Ha)		B:C Ratio	
	Furrow	Drip	Furrow	Drip	Furrow	Drip
15	80131.21	81496.21	267368.79	3319181.36	4.33	9.36
20	82861.21	84226.21	650955.45	569044.69	6.62	20.44
25	83953.21	90562.21	617546.79	604414.59	8.35	16.34
30	87956.21	93563.31	523043.79	634651.69	7.01	13.47

Conclusions

Based on the obtained results of the effect of different planting methods, seedling length & irrigation levels on yield and irrigation water productivity of onions, as well as total soluble solids in bulbs, it was concluded that irrigation had highly significant effect on all the studied parameters, except for soluble solids in bulbs. Drip irrigated beds yielded max with large grade size onions, irrigation water productively was also observed to be maximum in drip irrigated beds followed by furrow irrigated beds. However, the quality of onion was remained unaffected under different planting methods and irrigation levels. To achieve a high production potential of onion, appropriate soil moisture should be maintained during the entire growing season. It could be concluded that drip bed irrigation should be adopted for higher grade size onions, higher productivity and water productivity. The study revealed that highest yield of 28.5 t ha^{-1} was recorded with a bulb size of 36 mm although the total cost of production increased considerably with increase in levels of irrigation and moving from surface to subsurface irrigation methods. The total cost of production varied from 87956.21 Rs/ha to 93563.31 Rs ha^{-1}.

The overall result revealed that irrigation method and planting method has considerable influence on the yield. B:C Ratio varied from 9.36-13.47 (Rs ha^{-1}). The study was intended to infer that the marginal farmer can adopt furrow method of irrigation as compared to other irrigation method on the initial cost of cultivation in drip irrigation (subsurface) was much higher. This will boast the household income of the marginal farmer improving their standard of living.

References

1. Enciso J, Wiedenfeld B, Jifon J, Nelson S. Onion yield and quality response to two irrigation schedule strategies. Sci. Horticult. 2009; 120:301-305.
2. Halvorson AD, Bartolo ME, Reute CA, Bersada A. Nitrogen effects on onion yield under drip irrigation and furrow irrigation Agron J. 2008; 100(4):1062-1069.
3. Reddy M, Ayyanagowdar MS, Nemichandrappa M, Balakrishnan P, Patil MG. Techno economic feasibility of drip irrigation for onion (Allium Cepa L.) Karnataka J. Agric. Sci. 2012; 25(4):475-478.
4. Imtiyaz M, Saroha N, Alam MA. Marketable yield, irrigation production efficiency and economic return of onion under variable irrigation and lateral spacing. Proceeding of the International Agricultural Engineering Conference, Bangkok, Thailand, 2007.
5. Kohls R, Uhl J. Marketing of Agricultural Products New York, Mc Millan Publishing Company U.S.A. Krishna P.V. (1976) Indian Journal of Agricultural Marketing. 1980; 7(1):27-32.
6. Lale U. Food marketing in India: Private performance and public policy Ithaca, New York, Corenell University Press, 1971.
7. Patil PS, Jadhav DV. Adoption of cultivation practices of onion in North- West Maharashtra Extn. 1987; 6:153-157.