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RESEARCH ARTICLE

# Influence of Drip Fertigation on Yield, Quality parameters and Economics of Aggregatum Onion

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**Abstract**

A field experiment was conducted at Agricultural Research Station, Bhavanisagar, to evaluate the yield, quality and economics as influenced by different drip fertigation treatments on aggregatum onion during *kharif 2017*. The treatment consists of 100 per cent N through fertigation with 100 per cent P and K applied as basal, 100 per cent N and K through fertigation with 100 per cent P applied as basal, 100 per cent N, P and K through fertigation, 75 per cent N, P and K through fertigation and 25 per cent N, P and K applied as basal, 75 per cent N through fertigation with 75 per cent P and K applied as basal, 75 per cent N and K through fertigation with 75 per cent P applied as basal, 75 per cent N, P and K through fertigation, 75 per cent of 75 per cent N, P and K through fertigation and 25 per cent of 75 per cent N, P and K applied as basal, 50 per cent N 100 per cent P and K applied as basal and 50 per cent N applied on 30 days after transplanting (DAT), absolute control. Among different fertigation treatments imposed 100 per cent N, P and K through fertigation registered higher quality, yield (23.24 t ha$^{-1}$) and was comparable with 75 per cent N, P and K through fertigation.

**Keywords:** *Aggregatum onion, Drip fertigation, Yield, Quality and Economics.*

## Introduction

Onion (*Allium cepa* L.) is one of the most important commercial vegetable crop being grown extensively in southern states of India and mainly famous for its pungency used in sambar preparation and important dish in south Indian kitchen. Around 90 per cent of country's small onion is produced from Tamil Nadu and 10 per cent from Karnataka. Fertigation - a modern agro-technique provides an excellent opportunity to maximize yield and minimize environmental pollution (Hagin *et al*., 2002) by increasing fertilizer use efficiency, minimizing fertilizer application and increasing return on the fertilizer invested. Tripathi *et al*. (2010) reported that the slow and frequent application of pre-determined rate of water application could provide constant soil moisture availability to the crop at root zone resulting in increased yield of onion. Fertigation allows the landscape to absorb up to 90 per cent of the applied nutrients, while granular or dry fertilizer application typically result in absorption rates of 10 to 40 per cent. Fertigation ensures saving in fertilizer 40-60 per cent, due to "better fertilizer use efficiency" and "reduction in leaching" (Kumar and Singh, 2002). The right combination of water and nutrients is a prerequisite for getting good quality crop production. Keeping the above mentioned facts in view, an attempt has been made to study the influence of drip fertigation on yield, quality and economics of aggregatum onion.

## Material and Methods

The experiment was conducted at Agricultural Research Station, Bhavanisagar during July to December, 2017. The experimental site is located at 11°29'N latitude, 77°08'E longitude with an altitude of 256m above mean sea level. Soil of the experimental site was sandy clay loam with a pH 7.7, low in organic carbon (0.40 %), low in available nitrogen (250 kg ha$^{-1}$), high in available phosphorus (24 kg ha$^{-1}$), and high in available potassium (352 kg ha$^{-1}$). The variety used for study was CO(On)5, a seed propagated onion. Experiment was laid out in randomised block design with ten fertigation treatments replicated thrice *viz.* 100 per cent N through fertigation with 100 per cent P and K applied as basal, 100 per cent N and K through fertigation with 100 per cent P applied as basal, 100 per cent N, P and K through fertigation, 75 per cent N, P and K through fertigation and 25 per cent N, P and K applied as basal, 75 per cent N through fertigation with 75 per cent P

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and K applied as basal, 75 per cent N and K through fertigation with 75 per cent P applied as basal, 75 per cent N, P and K through fertigation, 75 per cent of 75 per cent N, P and K through fertigation and 25 per cent of 75 per cent N, P and K applied as basal, 50 per cent N 100 per cent P and K applied as basal and 50 per cent N applied on 30 DAT, absolute control. Quality parameters such as ascorbic acid and acidity content of fruits were analyzed as per the method suggested by A.O.A.C (1975). The cost of cultivation, gross return, net return and benefit cost ratio were calculated on the basis of prevailing market price of different inputs and outputs. The data was statistically analyzed based on the procedure given by Gomez and Gomez (1984).

## Results and Discussion

### *Bulb production*

Among the different fertigation treatments, the higher bulb number clump$^{-1}$ (5.210) was recorded in drip fertigation at 100 per cent N, P& K through fertigation ($T_3$) and was comparable with 75 per cent N, P, K through fertigation (4.512). The increase in bulb number might be due to better nutrient uptake pattern and similar report was also reported by Savitha *et al.* (2010).

**Table 1. Yield attributes and yield of onion as influenced by drip fertigation treatments**

| Treatment | Bulb number clump$^{-1}$ | Bulb weight (g plant$^{-1}$) | Bulb yield (t ha$^{-1}$) |
|---|---|---|---|
| $T_1$- 100 % N through fertigation with 100% P & K applied as basal | 3.650 | 62.50 | 18.10 |
| $T_2$- 100 % N & K through fertigation with 100% P applied as basal | 3.821 | 66.00 | 20.01 |
| $T_3$- 100 % N, P & K through fertigation | 5.210 | 75.24 | 23.24 |
| $T_4$- 75 % N, P & K through fertigation & 25% N, P & K applied as basal | 4.481 | 68.30 | 20.62 |
| $T_5$- 75 % N through fertigation with 75 % P & K applied as basal | 3.541 | 58.00 | 17.20 |
| $T_6$- 75 % N & K through fertigation with 75 % P applied as basal | 3.751 | 64.00 | 19.19 |
| $T_7$- 75 % N, P & K through fertigation | 4.512 | 73.81 | 22.74 |
| $T_8$- 75 % of 75% N, P & K through fertigation & 25% of 75% N, P & K applied as basal | 4.451 | 67.50 | 20.36 |
| $T_9$- 50 % N & 100% P, K applied as basal & 50% N applied on 30 DAT | 3.560 | 60.50 | 17.74 |
| $T_{10}$- Absolute control | 2.700 | 48.00 | 13.91 |
| SEd | 0.195 | 2.93 | 1.05 |
| CD (P=0.05) | 0.410 | 6.16 | 2.21 |

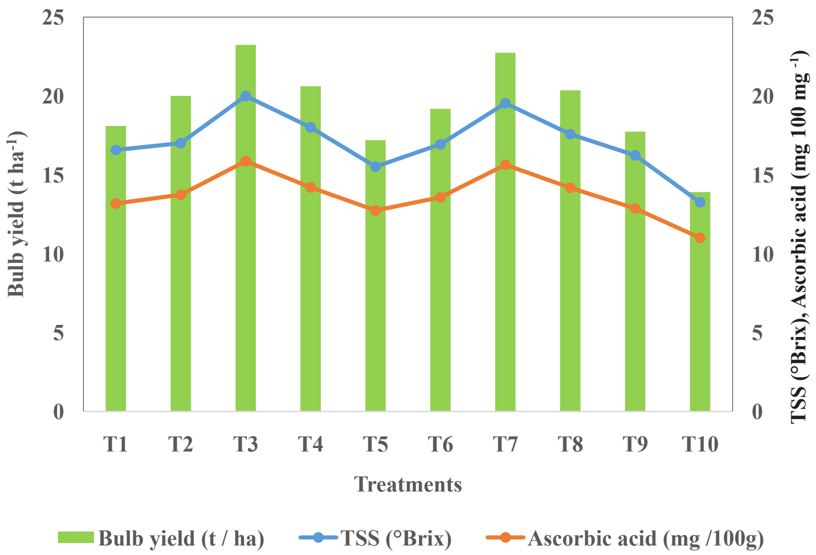


**Fig. 1. Yield and quality parameters of onion as influenced by drip fertigation treatments**

### *Bulb weight*

100 % N, P& K through fertigation ($T_3$) (75.24 g plant$^{-1}$) recorded higher bulb weight (Table 1 & Fig. 1.) and was comparable with 75 per cent N, P, K through fertigation (73.81 g plant$^{-1}$). The increase bulb weight was due to better translocation of assimilates from source to sink thus in turn increased the yield. This was in correlation with the findings of Hebbar *et al.* (2004) findings which showed that fertigation with 100 per cent water soluble fertilizers (WSF) increased the tomato fruit weight.

**Table 2. Total soluble solids (⁰Brix) and Ascorbic acid content (mg 100g$^{-1}$) of onion as influenced by drip fertigation treatments**

| Treatment | TSS (°Brix) | Ascorbic acid (mg 100g$^{-1}$) |
|---|---|---|
| $T_1$- 100 % N through fertigation with 100% P & K applied as basal | 16.58 | 13.19 |
| $T_2$- 100 % N & K through fertigation with 100% P applied as basal | 17.01 | 13.74 |
| $T_3$- 100 % N, P & K through fertigation | 20.00 | 15.87 |
| $T_4$- 75 % N, P & K through fertigation & 25% N, P & K applied as basal | 18.01 | 14.21 |
| $T_5$- 75 % N through fertigation with 75 % P & K applied as basal | 15.52 | 12.75 |
| $T_6$- 75 % N & K through fertigation with 75 % P applied as basal | 16.94 | 13.58 |
| $T_7$- 75 % N, P & K through fertigation | 19.54 | 15.64 |
| $T_8$- 75 % of 75% N, P & K through fertigation & 25% of 75% N, P & K applied as basal | 17.58 | 14.18 |
| $T_9$- 50 % N & 100% P, K applied as basal & 50% N applied on 30 DAT | 16.24 | 12.87 |
| $T_{10}$- Absolute control | 13.25 | 11.01 |
| SEd | 0.47 | 0.58 |
| CD (P=0.05) | 1.62 | 1.22 |

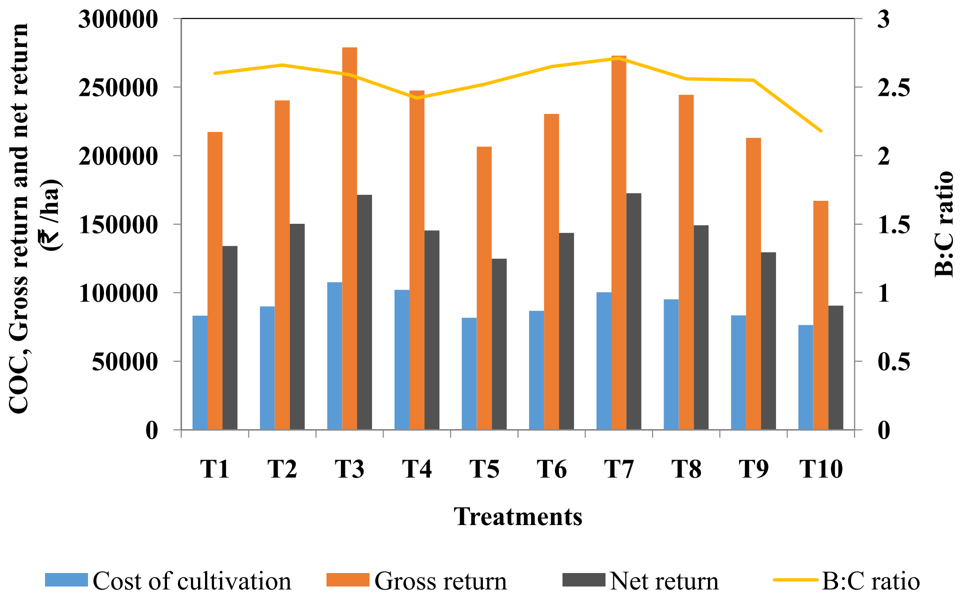


**Fig. 2. Economics of onion as influenced by drip fertigation treatments**

***Yield***

Strikingly higher and comparable bulb yield (Table 1 & Fig. 1.) was noticed in 100 % N, P & K through fertigation ($T_3$) (23.24 t $ha^{-1}$) and 75 per cent N, P, K through fertigation (22.74 t $ha^{-1}$). The increase in yield was due to better availability of nutrients supplied through fertigation during entire crop growth period. Similar results were also reported by Vijayakumar *et al.* (2011)

**Table 3. Economics of onion as influenced by drip fertigation treatments**

| Treatment | Cost of cultivation ( ₹ /ha) | Gross return ( ₹ /ha) | Net return ( ₹ /ha) | B:C ratio |
|---|---|---|---|---|
| $T_1$- 100 % N through fertigation with 100% P & K applied as basal | 78477 | 217260 | 138783 | 2.76 |
| $T_2$- 100 % N & K through fertigation with 100% P applied as basal | 85057 | 240228 | 155171 | 2.82 |
| $T_3$- 100 % N, P & K through fertigation | 102648 | 278988 | 176340 | 2.71 |
| $T_4$- 75 % N, P & K through fertigation & 25% N, P & K applied as basal | 97167 | 247512 | 150345 | 2.54 |
| $T_5$- 75 % N through fertigation with 75 % P & K applied as basal | 76726 | 206472 | 129746 | 2.69 |
| $T_6$- 75 % N & K through fertigation with 75 % P applied as basal | 81792 | 230388 | 148596 | 2.81 |
| $T_7$- 75 % N, P & K through fertigation | 95410 | 272892 | 177482 | 2.86 |
| $T_8$- 75 % of 75% N, P & K through fertigation & 25% of 75% N, P & K applied as basal | 90245 | 244344 | 154099 | 2.70 |
| $T_9$- 50 % N & 100% P, K applied as basal & 50% N applied on 30 DAT | 78477 | 212940 | 134463 | 2.71 |
| $T_{10}$- Absolute control | 71494 | 167028 | 95534 | 2.33 |

*Data not statistically analysed

***Total Soluble Solids***

Remarkably higher and comparable total soluble solids (Table 2 and Fig. 2) was registered in 100 per cent N, P & K through fertigation ($T_3$) (20.00°Brix) and 75 per cent N, P & K through fertigation ($T_7$) (19.54°Brix). The increase in Total Soluble Solids of bulb may be due to the fact that N has helped in vegetative growth and imparted deep green colour to the foliage, which favoured photosynthetic activity of the plants and hence there was greater accumulation of carbohydrates in the bulb which ultimately resulted in more synthesis of TSS content. Similar results were also reported by Chopde *et al.* (1998).

***Ascorbic acid***

Significantly higher and comparable ascorbic acid content (Table 2 and Fig. 2) was noticed in 100 per cent N, P & K through fertigation ($T_3$) (15.87 mg $100g^{-1}$) and 75 per cent N, P & K through fertigation ($T_7$) (15.64 mg $100g^{-1}$). The increase in ascorbic acid content in bulb might be due to K (quality element) supply which has close relationship between the carbohydrate metabolism and the formation of ascorbic acid. Similar results were also reported by Majumdar *et al.* (2000). In fertigation K is supplied using SOP which also contain sulphur, a secondary major nutrient that might have contributed for the production of several sulphur containing amino acids such as methionine, cysteine and tryptophan. Similar results were also reported by Thakre *et al.* (2005) in Brinjal.

***Economics***

The results (Table 3 and Fig. 3) of the investigation clearly indicated that 75 per cent N, P & K through fertigation ($T_7$) recorded higher net returns ( ₹ 177462 $ha^{-1}$) and benefit cost ratio (2.86). This was due to lower use of fertilizers and similar reports were also reported by Krishnamoorthy *et al.* (2015)

## Conclusion

In aggregatum onion, 75 per cent N, P & K through fertigation ($T_7$) using water soluble fertilizers at weekly intervals was found to be the best fertigation treatment for achieving higher yield, quality and economic returns.

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