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*Annals of Horticulture 6(1) : 30-34 (2013)* *Hi-tech Horticultural Society*

# Response of Onion (*Allium cepa* L.) Varieties to Farm Yard Manure in Arid Region of Western Rajasthan

**P.K. Kaswan P. K. Yadav and B.D. Sharma***

Department of Horticulture, College of Agriculture,
Swami Keshwanand Rajasthan Agricultural University, Bikaner–334 006
*Central Institute for Arid Horticulture, Bikaner–334 006

## ABSTRACT

An experiment was conducted on response of Onion (*Allium cepa* L.) varieties to Farm Yard Manure in Arid Region of Western Rajasthan in Horticulture Farm at Swami Keshwanand Rajasthan Agricultural University, Bikaner, during *Rabi* season 2009-2010. The experiment comprising four varieties of onion *viz.*, PDR, RO – 59, RO – 252 and RO – 282 and different levels of FYM *viz.*, 0, 20, 40 and 60 t $ha^{-1}$. The total treatment combinations were 16 with three replications. The plant height, number of leaves per plant, fresh and dry weight of leaves, fresh weight of bulb, diameter of bulb, volume of bulb and bulb yield were maximum under the variety RO – 252. Number of leaves per plant, plant height, fresh weight of bulb, diameter of bulb, volume of bulb, bulb yield, TSS and pungency were found maximum with the application of FYM @ 40 t $ha^{-1}$ however, plant height was recorded to be maximum with the application of 60 t FYM $ha^{-1}$.

***Key words:*** *Bulb, farm yard manure, onion, plant height, varieties.*

## INTRODUCTION

Onion (*Allium cepa* L.) is one of the commonest and indispensable vegetable cum condiment crops grown for local consumption, export and processing. Out of 15 vegetables listed, it ranks second only to tomato in terms of annual production (2). Onion is used as salad and cooked in various ways in all curies, fried, boiled, baked, soup making and in pickles. Onion is also dehydrated in the form of powder. Under arid areas of Rajasthan, it is successfully grown in 41.01 thousand hectare area with 369.07 metric tonnes production. Soils of Western Rajasthan, particularly in Bikaner district, contain very low clay (4-6%) and organic matter (0.08), N (0.50), P (0.25) and K (0.50). Farmyard manure (FYM) rich in organic matter can be supplemented with N, P and K fertilizers. FYM not only provides most of the essential plant nutrients but also improves soil structure through binding effect on soil aggregates, Cation exchange capacity, water holding capacity, fertilizers use efficiency, microbial activity and nutrient availability in soil.

FYM with chemical fertilizers and their method of application help in improving the fertility and productivity and physical condition of soil (1). Among the various factors responsible for higher yield potential, the application of adequate quantities of FYM is considered as one of the most effective way to boosting the crop yield (8,12) in soils of western Rajasthan. The main reason for low productivity is lack of suitable varieties for cultivation in arid areas. Most of the farmers are illiterate and always remain under confusion about recommended varieties. One of the important aspects of improvement in yield and quality of onion is the selection of suitable cultivars to a particular agro-climatic region. Therefore, keeping in view the above consideration, an experiment was carried out to find out response of onion (*Allium cepa* L.) varieties to farm yard manure.

## MATERIALS AND METHODS

The experiment was conducted at Horticulture Farm, College of Agriculture, Swami Keshwanand Rajasthan Agricultural University, Bikaner, during

*Rabi* season 2009-2010 with 4 varieties *viz.*, Poona Deshi Red (PDR), RO – 59, RO – 252 and RO – 282) and 4 levels of FYM *viz.*, 0, 20, 40 and 60 t ha$^{-1}$ in different combinations. In this way there were 16 treatment combinations. Each treatment was replicated three times and which were allocated randomly to different plots by using random numbers. Seven week old seedlings were transplanted with a spacing of 15 x 10 cm on 2nd December 2009. The irrigation was applied through drip system consisted of 16 mm laterals having drippers at 40 cm distance. Each plot consisted of 3 laterals at 80 cm apart and four rows of onion were planted at each lateral. As per treatment FYM was applied at the time of field preparation and chemical fertilizers i.e. nitrogen, phosphorus and potassium (100, 50 and 100 kg/ha) were applied through Urea, DAP and MOP. The observations on plant height, Number of leaves per plant, Fresh weight of leaves were recorded 60 and 90 days after transplanting. Fresh weights of bulb (before separating the bulb from foliage), diameter of bulb, volume of bulb and bulb yield were recorded after harvesting of crops.

## RESULTS AND DISCUSSION

### GROWTH ATTRIBUTES

Among varieties RO-252 produced significantly higher plant height and maximum number of leaves per plant at 90 days after transplanting. Plant height and number of leaves per plant are the genetic characters and hence different varieties varied with respect to these characters which ultimately brought about variation in fresh weight of leaves. This finding corroborate with the earlier results (8). The maximum plant height (57.93 cm) as well as number of leaves/ plants (7.07) was observed with the application of 60 tonnes FYM (fig 1&2). Fresh weight of leaves (17.27) was found maximum with FYM 40 t ha$^{-1}$. These results are in agreement with the findings in tomato and cabbage (9,5).

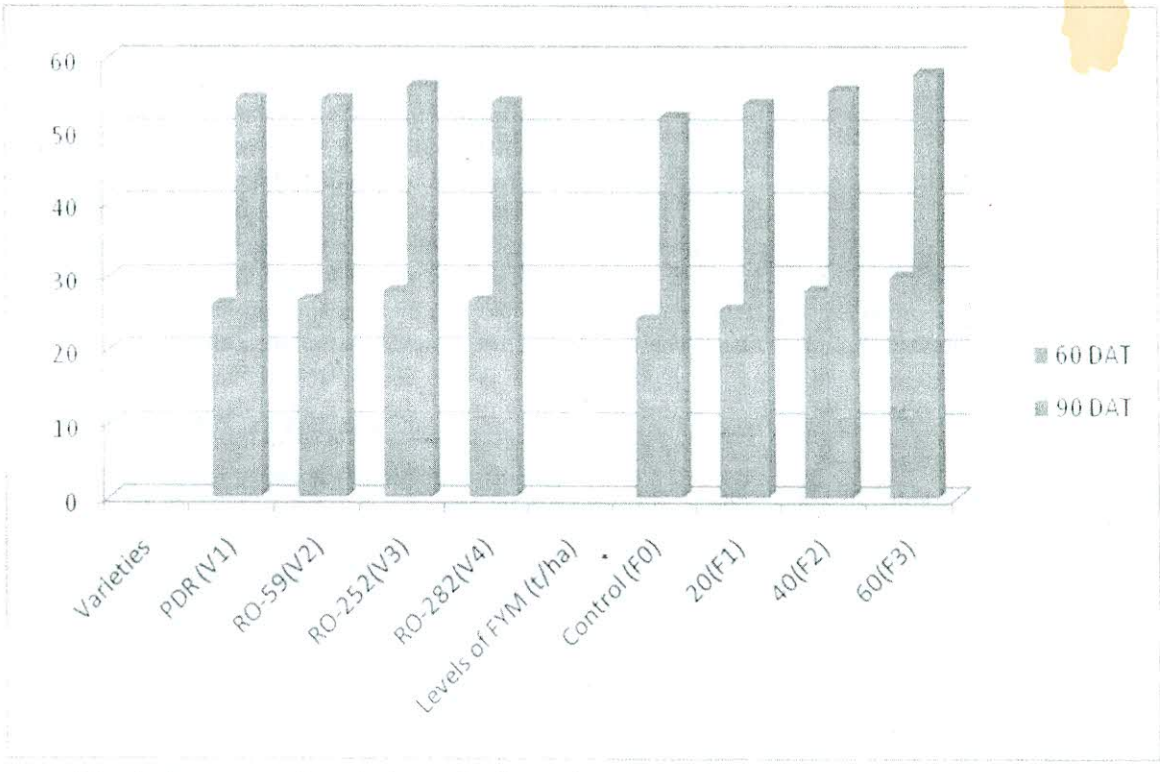


**Fig. 1: Response of varieties and effect of FYM levels on plant height (cm) of onion**

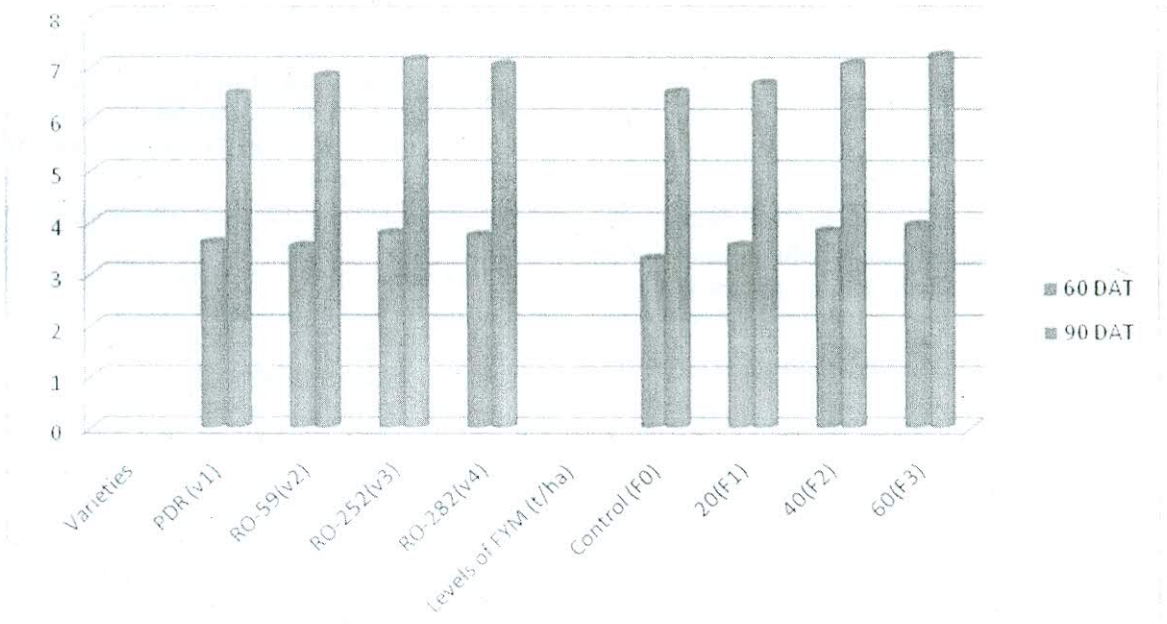


**Fig. 2: Response of varieties and effect of FYM levels on number of leaves of onion**

The fresh weight of leaves significantly affected by different varieties of onion however, significant difference could not be observed between RO – 59 and RO – 282. The significantly more fresh weight of leaves (18.21 g) was recorded in variety RO – 252. Similarly, the increasing levels of FYM increased the fresh weight of leaves. The more fresh weight of leaves was recorded with the application of 60 t FYM $ha^{-1}$ over control. However, significant effect could not be observed between $F_1$ - $F_2$ and $F_2$ - $F_3$.

## YIELD RELATED ATTRIBUTES

RO-252 variety produced significantly higher fresh weight (18.21g), diameter (5.34 cm), volume of bulb (57.98 cc) and bulb yield (290.49 q $ha^{-1}$). This might be due to characteristics of this variety that increased vegetative growth in terms of plant height and number of leaves per plant which resulted in higher fresh weight of bulb. These characters play a vital role in various metabolic processes primarily that results in increased net photosynthesis and helps in the translocation of photosynthates in storage organ of bulb resulting in increased weight of bulb. Similar results were observed by in onion (7,8). The application of FYM is considered important in promoting rapid fresh weight of bulb in terms of bulb size (48.23g), diameter of bulb (5.87 cm), volume of bulb(62.47 cc) and bulb yield (315.17q $ha^{-1}$). These parameters were recorded significantly higher with application of 40 tonnes FYM per hectare. FYM promotes increased net photosynthesis and helps in the translocation of photosynthates in storage organ of bulb resulting in increased diameter and weight of bulbs. Similar findings were reported in onion crops (12).

It is evidenced from Table 1 that the diameter of bulb was influenced with different varieties of onion. Significantly maximum diameter of bulb was recorded in variety RO – 252 (5.34 cm) over PDR while it remain at par with RO – 282 and RO – 59. It was 13.85, 5.53 and 2.30 per cent higher over PDR, RO – 59 and RO – 282, respectively. Similarly the diameter of onion bulb was significantly influenced with different levels of FYM. The diameter of bulb was significantly increased with 40 t FYM $ha^{-1}$ over

20 t FYM $ha^{-1}$ and control but remains at par with 60 t FYM $ha^{-1}$. The increase in bulb diameter with $F_2$ level was 59.51 and 26.78 per cent over control and $F_1$ level, respectively. In the same way, volume of bulb was influenced by different varieties of onion and was recorded 57.98, 55.58, 54.90 and 53.73 cc in RO – 252, RO – 59, RO – 282 and PDR, respectively. Maximum volume of bulb was recorded in RO - 252 which was 7.90, 4.31 and 5.61 per cent higher than PDR, RO – 59 and RO – 282, respectively. Data related to volume of bulb in Table 1 further showed that different levels of FYM were produced significant effect on volume of bulb. The increasing levels of FYM were significantly increased the volume of bulb up to 40 t FYM $ha^{-1}$. The application of 40 t FYM $ha^{-1}$ resulted significantly higher volume of bulb over 20 t FYM $ha^{-1}$ and control. However, further increase in FYM 40 t to 60 t $ha^{-1}$ could not increase volume of bulb. The per cent increase in volume of bulb in level of 40 t FYM $ha^{-1}$ was 53.18 and 13.31 per cent over control and 20 t FYM $ha^{-1}$, respectively. In a similar study, increase in volume of bulb with increasing FYM level was reported in onion crops (14).

Bulb yield was obtained maximum upto 40 t $ha^{-1}$ FYM (Table 1). Further increase in FYM level upto 60 t $ha^{-1}$ could not increase the yield significantly. The application of 40 t FYM $ha^{-1}$ significantly increased the bulb yield (315.17 q $ha^{-1}$) over control (182.18 q $ha^{-1}$) and 20 t FYM $ha^{-1}$ (242.01 q $ha^{-1}$) but remains at par with 60 t FYM $ha^{-1}$. The bulb yield of onion in 40 t FYM $ha^{-1}$ was observed 72.99 and 30.23 per cent higher over control and 20 t FYM $ha^{-1}$, respectively. Similar results were reported by in onion crops (4,14). Significantly higher bulb yield (290.49 q $ha^{-1}$) was recorded in variety RO – 252 over PDR, RO – 59 and RO – 282. Whereas, there was not observed any significant difference among the PDR (251.88 q $ha^{-1}$), RO – 59 (268.14 q $ha^{-1}$) and RO – 282 (258.39 q $ha^{-1}$) of onion varieties. Thus the bulb yield of RO – 252 was found 15.32, 8.33 and 12.42 per cent higher over PDR, RO – 59 and RO – 282, respectively. The reason for increased bulb yield with the application of farm yard manure could be attributed to solubilization effect of plant nutrients by the addition of FYM leading to increased uptake of nutrients especially NPK (13,10,11).

## QUALITY ATTRIBUTES

Highest TSS content (12.03 $^0$Brix) was recorded in RO – 252 variety of onion followed by RO – 59, RO – 282 and PDR which was 2.82, 2.99 and 6.64 per cent higher over RO – 59, RO – 282 and PDR, respectively. However, there was non-significant difference observed between RO – 59 and RO – 282. Data further revealed that application of 40 t FYM $ha^{-1}$ produced significantly higher total soluble solids (TSS). It was significantly increased the TSS content over control and 20 t FYM $ha^{-1}$ while, it remain at par with 60 t FYM $ha^{-1}$ (Table 1). The TSS increase with 40 t FYM $ha^{-1}$ was 8.74 and 3.55 per cent over control and 20 t FYM $ha^{-1}$, respectively. Pungency was recorded at harvest maximum (5.59 mg/100 g) in PDR followed by RO – 282, RO – 59 and RO – 252 which was 2.76, 4.68 and 5.07 per cent higher, respectively(Table 2). Pungency was also affected with levels of FYM. Increase in FYM levels could increase the pungency significantly over control. Higher pungency with increased level of FYM has also been reported earlier in onion (6,3). The increase in pungency of onion at higher level of FYM was due to increase in synthesis and translocation of sulphur to the onion.

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**Received : September, 2012, Revised : December, 2012, Accepted : February, 2013.**