

Effect of Various Levels of N in Combination with FYM on the Growth and Establishment of Date Palm (Dhakki) Cultivar

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Abstract. This study was carried out during the year 2008-2009 at AZRI farm, D.I. Khan to investigate optimum dose of nitrogen (N) fertilizer and Farm Yard Manure (FYM kg/plant) for improving fruit bearing growth parameters of date palm cv. Dhakki. Four treatments consisted of (1) control (2) 0.5 kg N + 15 kg FYM (3) 1 kg N + 15 kg FYM (4) 1 kg N + 0 kg FYM/plant were applied. The results showed that 1 kg (N) + 15 kg FYM had number of fronds (38)/plant, plant spread (511.7 cm), plant girth (211.7 cm), frond length (253 cm), number of fruit (9.3)/stain, fruit weight (4.3 kg)/bunch and total fruit yield (26.58 kg)/plant at 5 year stage among all other treatments. However, the maximum values for these parameters including fruit yield (11.32 kg/tree) were recorded in control where no fertilizer or manure was applied.

Keywords: nitrogen; farm yard manure; growth parameters, fruit yield

Introduction

Date palm (*Phoenix dactylifera* L.) belongs to Palmaceae family. It is one of the most ancient fruits of the arid, tropical and subtropical regions of the world. The yield of Dhakki dates in Dera Ismail Khan is not up to its potential due to lack of suitable cultural practices including application of proper fertilizer to the soils which are deficient in micro and macro nutrients and organic matter. Determination of optimum dose of fertilizers for this plant may lead to more yield production, higher quality of fruits and considerable reduction in the farm expenses. Earlier researchers like Kassem *et al.* (1997) and Abdalla *et al.* (1987) quoted that the yield, fruit quality and leaf mineral have been improved with the application of nitrogen and potassium fertilization in date palm. Sabbah (1993) reported that using 750 g N and 750 g P₂O₅ for each fruitful tree caused the highest yield production. El-Hammady *et al.* (1991) studied the effect of potash fertilization on yield and fruit quality of date palm and found that the potash fertilizer has a considerable effect on physiological parameters of date palm plants. Harhash (2000) studied the effect of potassium fertilization on fruit thinning of date palm and observed that potassium fertilizer caused the best yield and fruit quality. Bilsborough and Blackpool (2000) and Carpenter (1981) reported that nutrients deficiency in young date palm has apparent symptoms that pose bad impact on yield and quality of fruit. Saleh (2008) and Dong (2005)

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depicted that using 2.5 kg NPK along with micro-nutrient fertilizers caused the highest yield and best quality fruit.

Keeping in view the desirable effects of macronutrients application on yield and fruit quality, it was necessary to determine the optimum levels of fertilizers and manure in order. This study was therefore, conducted to determine the optimum dose of nitrogen and FYM to obtain maximum yield and desirable fruit quality of cultivar 'Dhakki' under the ecological zone of Dera Ismail Khan, KPK, Pakistan.

Materials and Methods

The experiment was conducted at AZRI farm, D.I. Khan during 2008-2009 to investigate the optimum dose of nitrogen (N) with Farm Yard Manure (FYM). The study was carried out on 5 years old plants of Dhakki cultivar which were planted in RCBD at 8 meters apart, three palm trees about 5 years old as uniform as possible were selected for data recording. Soil samples were taken before applying the treatments and analyzed for various physico-chemical properties. Results are presented in Table 1. Treatments were consisted of 4 levels of nitrogen + FYM (i.e., 0, 0.5 kg N + 15 kg FYM, 1 kg N + 15 kg FYM and 1 kg N + 0 kg FYM g/tree). These nitrogen (N) and farm yard manure levels were applied with basal dose of 1 kg P₂O₅ and 0.5 kg K₂O₅ tree during the month of December. The fertilizer was applied in bands about 4 feet wide and 18 inches away from the trunk. After applying the fertilizer the

plants were irrigated immediately. The data were recorded on plant height, number of fronds/plant, plant spread, plant girth, frond length, number of pineae/frond, number of suckers/plant, number of bunches/plant, number of strains/bunch, number of fruits/stain, fruit weight/bunch (kg) and total fruit yield/plant. The data were analyzed statistically using analysis of variance (ANOVA) procedure and LSD ($P < 0.05$) values calculated for comparing means (Steel and Torrie, 1980). All other cultural practices were performed uniformly throughout the growing season.

Table 1. Physico-chemical properties of the experimental site during 2008-2009

| Properties | Parameters | Value |
|---------------------|--------------------|-------|
| Chemical properties | pH | 8.1 |
| | ECe (dS/m) | 4.5 |
| | Organic matter (%) | 0.71 |
| | Available K(mg/kg) | 110 |
| Physical properties | Clay | 56.0 |
| | Silt | 36.0 |
| | Sand | 8.0 |
| | Texture | Clay |

Results and Discussion

Data presented in Table 2 revealed that all the growth parameters were significant at 5% probability level ≤ 0.05 affected with various levels of nitrogen (N) in combination with Farm Yard Manure (FYM) except branches/plant.

Plant height (cm). Plant height ranged between 298.3 to 359.5 cm. Minimum plant height of 298.3 cm was observed in control plot followed by receiving of only 1 kg N with FYM appeared with a plant height of 308 cm. Both the said treatments were at par statistically (Table 3). Plant height of date palm increased with nitrogen and farm yard manure application. However, 1 kg N and 15 kg farm yard manure/tree caused the highest plant height i.e., 359 cm followed by at par value 356.7 cm plant height with the combination of 0.5 kg N + 15 kg FYM. Both of these combinations showed their positive effect due to receiving of proper rain fall and suitable temperature during February to April (Table 4). Increase in plant height by using nitrogen fertilizer and farm yard manure (FYM) in date palm was also reported by Harhash (2000); Kassem *et al.* (1997); Sabbah (1993); Furr *et al.* 1951.

Table 2. Effect of various levels of N in combination with FYM on the growth of date palm c.v. "Dhakki" during 2008-2009

| Treatments | Fertilizer rate N+FYM kg/ha | No. of suckers/plant | No. of bunches/plant | No. of strands/bunch | No. of fruit/strand | Fruit/ brunch kg | Total fruit yield/plant |
|------------|--------------------------------|-------------------------|-------------------------|-------------------------|------------------------|---------------------|----------------------------|
| T1 | Control | 4.06b | 5 | 30.67b | 6.0c | 2.83c | 11.32c |
| T2 | 0.5-15 | 4.6b | 5 | 34.33a | 7.0bc | 3.7b | 18.65b |
| T3 | 1.0-15 | 7.3a | 6 | 35.33a | 9.3a | 4.43a | 26.58a |
| T4 | 1.0-0 | 7.3a | 5 | 31.00b | 8.3ab | 3.76b | 18.80b |
| LSD 0.05 | – | 2.1 | NS | 29.92 | 1.9 | 0.38 | 5.22 |

a, b, ab and c letters are indicating Duncun multiple range test. Means within a column followed by the same letter are not significantly different at the 5% level.

Table 3. Effect of various levels of N in combination with FYM on the growth of date palm c.v. "Dhakki" during 2008-2009

| Treatments | Fertilizer rate N+FYM kg/ha | Plant height (cm) | No. of fronds/plant | Plant spread | Plant girth | Fronds length (cm) | No. of pinnae/frond |
|------------|--------------------------------|----------------------|------------------------|-----------------|----------------|-----------------------|------------------------|
| T1 | Control | 298.3b | 29.67b | 440.7c | 170.0c | 208.3d | 142.7b |
| T2 | 0.5-15 | 356.0a | 30.67b | 476.7b | 180.0c | 237.b | 147.0ab |
| T3 | 1.0-15 | 359.0a | 38.00a | 511.7a | 211.7a | 253.0a | 151.7a |
| T4 | 1.0-0 | 308.0b | 26.00c | 463.3b | 195.0b | 235.0c | 142.7b |
| LSD 0.05 | | 19.9 | 1.85 | 18.5 | 11.5 | 10.4 | 5.3 |

a, b, ab, c and d letters are showing Duncun multiple range test. Means within a column followed by the same letter are not significantly different at the 5% level.

Table 4. Mean agro-meteorological data of the experimental site during 2008-2009

| Month | Air temperature | | Relative humidity (%) | | Rain fall (mm) |
|--------------|-----------------|-----|-----------------------|--------|----------------|
| | Max | Min | 0800 h | 1400 h | |
| | July-08 | 39 | 25 | 83 | |
| August-08 | 37 | 23 | 83 | 66 | 54 |
| September-08 | 35 | 22 | 78 | 61 | 58 |
| October-08 | 32 | 20 | 76 | 55 | - |
| November-08 | 29 | 9 | 71 | 38 | - |
| December-08 | 23 | 5 | 81 | 56 | 9 |
| January-09 | 21 | 5 | 76 | 57 | 3.5 |
| February-09 | 23 | 9 | 81 | 54 | 15.5 |
| March-09 | 28 | 13 | 79 | 60 | 48.0 |
| April-09 | 33 | 17 | 71 | 54 | 15.5 |
| May-09 | 39 | 23 | 70 | 43 | 1.0 |
| June-09 | 39 | 25 | 70 | 48 | - |
| July-09 | 37 | 27 | 83 | 62 | 30.0 |
| August-09 | 37 | 26 | 88 | 71 | 51.5 |
| Total | - | - | - | - | 376 |

Number of fronds/plant. Number of fronds/plant ranged from 29.6 to 38.0/plant. The application of 1.0 kg and 15 kg FYM produced maximum fronds; 38/plant among the treatments, while the lowest number of fronds 26/plant observed in plots receiving only 1 kg N with out FYM as well as control appeared with fronds (20)/plant (Table 2). Positive effects of nitrogen fertilizer and FYM on number of fronds plant of date palm has been reported by Al-Kharusi *et al.* (2007); Harhash (2000); Montasser *et al.* (1991); El-Hammady *et al.* (1991).

Plant spread. Plant spread differed significantly with various levels of N and FYM application ranging from 440.7 cm to 511.7 cm. Among the treatments receiving of 1 kg N in combination with 15 kg FYM plant, produced maximum 511.7 cm plant spread, while lower level 0.5 kg N along with 15 kg FYM plant and only receiving 1 kg N plant appeared statistically the same producing 476.7 and 463.3 cm plant spread. Moreover, the control treatment produced the lowest plant spread 440.7 cm (Table 3). The results are in line with the researchers like Rajaie *et al.* (2009); Harhash (2000) and Kassem *et al.* (1997), who reported the positive effects of N and FYM fertilization on date palm.

Plant girth. Plant girth was also significantly affected with different levels of N and FYM ranging from 170 to 211.7 cm. The highest plant girth (211.7 cm)

was noted among the treatment with the application of 1 kg N along with 15 kg FYM/plant while the lowest 170 cm plant girths in control plot. Application of 1 kg N + 15 kg FYM/plant appeared the optimum combination for obtaining maximum plant girth (Table 3).

Froned length. The froned length of various treatments varied from 208.3 cm to 253 cm. The maximum froned length (253 cm) was obtained in treatment receiving 1 kg with 15 kg FYM/plant followed by 0.5 kg N with 15 kg FYM/plant produced froned length of 273.3 cm. However, control and nitrogen applied alone showed the lowest 208.3 and 225 cm froned length. This reduction in froned length with alone application of N showed the importance of FYM added treatments (Table 3). Optimum fertilizer in date palm improves quantitative and qualitative properties of production. In the present experiment the increase in froned length could be due to nitrogen and FYM's effect as reported by Harhash (2000); Broschat (1999) and Kassem *et al.* (1997).

Number of pinnea/froned. The data regarding number of pinnaea froned showed significant effect with N and FYM combination ranging from 147 to 151.7/froned although non-significant with both combinations (i.e., 0.5 or 1 kg N with 15 kg FYM/plant). But the lowest number of pinnea 142.7/froned were seen in the control as well as in the treatment where only N was applied (Table 3). This reduction in pinea/froned might be the results of non application of FYM with nitrogen fertilizer.

Number of suckers/plant. Number of suckers ranged from 4 to 7. The maximum suckers 7.3/plant were obtained in the treatment where 1 kg N in combination with 15 kg FYM/plant was applied which appeared at par with treatment receiving only 1 kg N/plant. But the lowest suckers 4.06/plant values were in control as well as in the treatment received 0.5 kg N along with 15 kg FYM/plant (Table 2).

Number of bunches/plant. The number of bunches/plant appeared for the first time at 5 years age as the date palm tree got its fruits but did not differ significantly with the application of organic and inorganic fertilizer. But its combined effect was improving as 1 kg N plus 15 kg FYM/plant generally produced highest 6 number of bunches/plant as compared to control i.e. 4 bunches/plant (Table 2).

Number of strand/bunch. The number of strand varied from 30.67 to 35.33/bunch. The highest number of

strand 35.33 were obtained in treatment receiving 1 kg N in combination with 15 kg FYM/plant among the treatments apart from the treatment of 0.5 kg N in combination with the same rate of 15 kg FYM/plant produced 34.33 number of strand/bunch. But both the treatments receiving of N alone and control produced significantly the lowest numbers of strand/bunch showing the importance of FYM which increased the efficiency of nitrogen (Table 2).

Number of fruit/strand. The number of fruit/strand with various levels of N and FYM significantly differed, ranging from 6 to 9.3. But the application of 1 kg N with 15 kg FYM/plant produced the highest fruit i.e., 9.3/strand followed by treatment that received only 1 kg N/plant and gave 8.3 fruit/strand. The lowest number of fruit 6/strand was recorded in the control where fertilizer and manure was not applied (Table 2).

Fruit weight/bunch. Fruit weight/bunch was also significantly affected with different levels of fertilizer ranging from 2.83 to 4.43 kg/bunch. Similar to most other of the other characters of the highest fruit 4.43 kg/bunch was recorded in the treatment received 1 kg N with 15 kg FYM/plant while 3.7 kg/bunch was recorded in both treatments i.e. applied 0.5 kg N with 15 kg FYM or 1 kg N/plant, but the lowest fruit 2.83 kg/bunch was observed in control treatment (Table 2).

Total fruit yield/plant. Significant differences were observed in fruit yield/plant with various levels of N and FYM application ranging from 11.32 kg to 26.58 kg. The said fruit data was recorded initially for the first time as date palm tree usually bearing fruit after 5 years of age. The fertilizer combined treatment like 1 kg N with 15 kg FYM/plant significantly produced the highest fruit 26.58 kg plant among the treatment followed by treatment receiving 0.5 kg N in combination with 15 kg FYM and 1 kg N alone/plant yielded fruit 18.65 and 18.80 kg plant and appeared at par statistically with each other. The lowest fruit yield 11.32 kg/plant was recorded in control plot. The application of 1 kg N with 15 kg FYM/plant appeared the optimum combination for obtaining maximum fruit yield/plant with an increase of 135% over control plot (Table 2). The present results are in line with Bashir *et al.* (2009) who reported that maximum yield 64 kg/plant of guava was recorded with the application of 20 kg FYM + 1 kg each of N-P₂O₅-K₂O/plant.

Conclusion

It can be concluded from the results that most of the physiological fruit bearing parameters were maximum with the combined application of 1 kg N + 15 kg FYM as compared to control as well as other levels of organic and inorganic fertilizer application. Therefore, the said rates of N with FYM appeared the most appropriate combination for obtaining maximum fruit setting parameters towards fruit/yield/tree.

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