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EFFECT OF FERTIGATION ON YIELD OF TENERA OIL PALM UNDER KONKAN COASTAL REGION OF MAHARASHTRA

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Abstract

Oil Palm is recognised as the major source of vegetable oil with an average oil yield level of 4 to 6 tons per hectare. However, the crop has heavy nutrient demand and high degree of sensitivity to major nutrients like N, P and K. Nevertheless, considering the importance of this crop as a potential long term source of edible oil, a field investigation was conducted with a view to study the effect of application of major nutrients through drip irrigation on yield of tenera oil palm in Konkan coastal region of Maharashtra. Six different dosage of fertilizers were followed through drip system by means of venturi and compared with fertilizer dose of 1200:600:2700 g NPK/Palm/Year through soil application. The experiment was carried out on 18 years old tenera oil palm orchard. The results of the pooled yield for three years by considering first three years after introduction of fertigation as a transition period indicated that fertilizers @ 1200: 600: 1800 g NPK/palm/year through six equal splits in a year in the form of Urea, Diammonium Phosphate and Muriate of potash through feritgation recorded highest bunch weight (25.0 kg/bunch), highest number of fresh fruit bunches (5.2 bunches/palm/year) and 18.8 tons of fresh fruit bunch yield.

Key words: *Oil palm, fertigation, fresh fruit bunch, yield*

Introduction

Oil palm is known for its exceptionally high oil yield as compared to the traditional oilseed crops and has wide adaptability to different climatic and soil conditions. Therefore, it could be considered as one of the most important source to meet the challenges of edible oil demand arising due to ever increasing population as well as per capita consumption of edible oil in near future. The palm oil is derived from fleshy mesocarp of the fruit, which contains about 45-55% of oil. The palm kernel oil, obtained from the kernel of stony seed, is a potential source of lauric oils. Palm oil has good acceptance as a cooking medium because of its price advantage. It is good raw material for manufacturing oleo chemicals used in making soaps, plasticizers etc., (Arulraj, 2015). Irrespective of soil and climate, fertilisation is essential in oil palm cultivation if growth and production potential is to be achieved (Caliman, 2009). The high productivity of oil palm has been demonstrated in well managed plantations of India and highest yield of 53.29 t FFB/ha/year has been reported at DOPR during 2012 (Annon., 2012). Out of the major practices that are responsible for yield improvement, nutrient management by fertilizer application is the most important contributor accounting for 26 per cent of the FFB yield increment in oil palm as stated by Prasad *et al.,* 2012. General fertilizer recommendation suggested by Gawankar, *et al*. (2010) for oil palm cultivation under Konkan conditions through soil application was 1200: 600: 2700 g NPK/palm/year. The application of fertilizers through soils during rainy season will result in leaching of nitrogenous and potassic fertilizers. The advantage of fertigation over conventional method was emphasized by several workers. Fertilizer application through drip system is effective method saving fertilizer cost, reduces labour requirement and supply nutrients according to the crop demand. Subramanian *et al*. (2012) showed drip fertigation is one of the options to increase the fertilizer use efficiency in coconut. Keeping this in view, present investigation was carried out to study the effect of fertigation on fresh fruit bunch yield of 18 years old tenera oil palm orchard.

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Materials and methods

The experiment was carried out at Agricultural Research Station, Mulde Tal : Kudal, Dist : Sindhudurg (M.S.), South Konkan coastal region of Maharashtra under All India Coordinated Research Project on Palms. The experimental site is located at 17 m above mean sea

level having hilly topography and lateritic to alluvial coarse shallow soil type. The field experiment was laid out in a randomised block design with three replications. Experimental palms under different fertilizer doses in fertilizer trial previously (1990 to 2008) were used as experimental material. Six different dosage of fertilizers were followed in to the drip system by means of venturi and compared with fertilizer dose of 1200; 600; 2700 g NPK/Palm/Year through soil application as recommended by Gawankar *et al.* (2010) on 18 years old tenera oil palm orchard which was earlier planted at 9 m × 9 m on contour under fertilizer cum irrigation experiment. Palms under different doses of fertilizer previously in fertilizer trial availed same trend of doses *i.e.* palms under lower doses were given lower dose of fertigation in order to maintain same nutrients status. The treatments were given in six equal splits in a year (bi-monthly) in the form of Urea, Diammonium Phosphate and Muriate of potash. The three years period *i.e.* from 2009 to 2011 was considered as transition period for present investigation (post treatment period) and hence yield data from the year 2011-12 to 2014-15 were taken for consideration. The data was statically analyzed by the method described by Gomez and Gomez (1984).

Results and discussion

Yield characters:

The data regarding the effect of different levels of NPK fertilizers through drip irrigation on number of bunches during the year 2011-12 to 2014-15 and pooled over the years is given in table 1. Data revealed that the fertigation treatments showed the significant differences in production of number of bunches. During the year 2012-13 and 2014-15, treatment $\mathbf{T_6}$ recorded maximum number of bunches per palm *i.e.* 5.8 and 4.8, respectively. Whereas, pooled mean data showed that treatment, $\mathbf{T_5}$ and $\mathbf{T_6}$ produced 5.2 bunches per palm and lower dose of fertilizers *i.e.* treatment $\mathbf{T_1}$, $\mathbf{T_2}$ and $\mathbf{T_3}$ recorded significantly lower number of bunches per palm. Soil application of recommended dose of fertilizer ($\mathbf{T_7}$) was at par with the treatment $\mathbf{T_5}$ and $\mathbf{T_6}$. The similar trend was also reported by Subramanian *et al*. (2012) in coconut, where they have reported significantly higher nut yield in 100 per cent NPK fertigation (131 nuts/palm/year) which was on par with 75 and 50 per cent NPK applied through drip irrigation.

Four years data and pooled mean data regarding effect of fertigation on bunch weight is presented in Table 2 and it revealed that, bunch weight was significantly differed among different treatments except during 2014-15. During the year 2011-12, treatment $\mathbf{T_5}$ recorded highest bunch weight (26.6 kg per bunch) as compared to other treatments. However, during the years 2012-13 and 2013-14, the maximum bunch weight (24.5kg and 25.3 kg, respectively) was recorded in treatment $\mathbf{T_7}$ as compare to rest of the treatments. Over the years, treatment $\mathbf{T_5}$ recorded significantly highest bunch weight (25.0 kg per bunch) which was closely followed by $\mathbf{T_7}$.

FFB yield

The yield data from the year 2005 to 2008 were treated as pre experimental yield data and were compared with pooled yield mean data of present investigation. Pre treatment yield data and yield data during the years 2011-12 to 2014-15 and pooled mean yield over the years are depicted in table 3. Data revealed that yield of fresh fruit bunches (FFB) did not differ significantly due to fertigation during the years 2011-12 and 2012-13 but during 2013-14 and 2014-15 treatment $\mathbf{T_5}$ (1200 : 600 : 1800 g NPK through fertigation) recorded highest yield (18.3 and 18.1 tonnes ha^{-1}, respectively). Pooled yield mean over the years also showed that treatment $\mathbf{T_5}$ has recorded 18.8 tonnes per hectare yield of FFB. The treatments with lower dose of fertigation, $\mathbf{T_2}$, $\mathbf{T_1}$, $\mathbf{T_3}$ and $\mathbf{T_4}$ recorded significantly lower yield and were in range of 13.1 to 15.0 tonnes ha^{-1}. Similarly higher dose of fertilizers *i.e.* treatment $\mathbf{T_6}$ and $\mathbf{T_7}$ also recorded lower FFB yield nevertheless, both treatments were at par with treatment $\mathbf{T_5}$. Higher FFB yield and higher monetary returns with fertigation in oil palm with 1200 : 600 : 1200 g NPK / palm/year in six equal splits at bi-monthly interval at Gangavati and Vijayarai centres (Anonymous, 2014).

In the present investigation, 1200 : 600; 1800 g NPK through fertigation ($\mathbf{T_5}$) recorded the highest yield due to

Table 1: Effect of fertigation on bunch production in tenera oil palm.

Treatments	No. of Bunches/palm/year				
	2011-12	2012-13	2013-14	2014-15	Pooled mean
$\mathbf{T_1}$ 300: 150: 300 g NPK through fertigation	4.9	4.0	4.2	3.6	4.2
$\mathbf{T_2}$ 600: 300: 600 g NPK through fertigation	5.2	4.3	4.4	3.6	4.4
$\mathbf{T_3}$ 900: 450: 900 g NPK through fertigation	5.3	5.4	5.2	3.5	4.9
$\mathbf{T_4}$ 1200: 600:1200 g NPK through fertigation	5.9	4.7	4.7	3.0	4.6
$\mathbf{T_5}$ 1200: 600: 1800 g NPK through fertigation	5.9	5.1	5.2	4.5	5.2
$\mathbf{T_6}$ 1200: 600: 2700 g NPK through fertigation	5.8	5.8	4.2	4.8	5.2
$\mathbf{T_7}$ 1200: 600: 2700 g NPK through soil application	6.1	5.3	4.8	4.0	5.1
SE ±	0.8	0.6	0.5	0.6	0.2
CD at 5%	**2.4**	**1.8**	**1.6**	**1.7**	**0.6**

Table 2: Effect of fertigation on bunch weight (kg/bunch) in tenera oil palm.

Treatments	Bunch weight (kg)Pooled mean (kg/palm)				
	2011-12	2012-13	2013-14	2014-15	
T_1 300: 150: 300 g NPK through fertigation	21.9	24.2	21.7	26.4	23.6
T_2 600: 300: 600 g NPK through fertigation	20.0	21.3	18.6	23.5	20.9
T_3 900: 450: 900 g NPK through fertigation	21.0	19.6	21.1	24.6	21.6
T_4 1200: 600:1200 g NPK through fertigation	22.8	23.3	20.9	25.0	23.0
T_5 1200: 600: 1800 g NPK through fertigation	**26.6**	22.2	24.9	**26.3**	**25.0**
T_6 1200: 600: 2700 g NPK through fertigation	19.2	22.9	24.9	24.7	22.9
T_7 1200: 600: 2700 g NPK through soil application	21.7	**24.5**	25.3	25.6	24.3
SE±	**2.2**	**1.3**	**1.6**	**2.0**	**0.8**
CD at 5%	**6.5**	**3.8**	**4.9**	**N.S.**	**2.3**

Table 3: Effect of fertigation on yield of tenera oil palm

Treatments	Pre treatment mean yield (t/ha)	Yield of FFB (t/ha)				Pooled yield (t/ha)
	2005-2008	2011-12	2012- 13	2013- 14	2014-15	
T_1 300: 150: 300 g NPK through fertigation	13.9	15.1	14.0	12.9	13.9	14.0
T_2 600: 300: 600 g NPK through fertigation	14.0	15.2	13.1	11.8	12.2	13.1
T_3 900: 450: 900 g NPK through fertigation	14.4	16.0	15.2	15.8	12.2	14.8
T_4 1200: 600:1200 g NPK through fertigation	14.9	19.4	15.6	14.0	10.9	15.0
T_5 1200: 600: 1800 g NPK through fertigation	15.5	22.7	16.2	18.3	18.1	18.8
T_6 1200: 600: 2700 g NPK through fertigation	15.7	16.0	18.6	15.2	17.1	16.7
T_7 1200: 600: 2700 g NPK through soil application	16.5	18.9	18.7	17.5	14.1	17.3
SE±	1.2	3.2	2.4	2.0	2.2	0.8
CD at 5%	3.6	N.S.	N.S.	5.9	6.6	2.2

production of more number of bunches and more bunch weight. The higher yield under fertigation treatment might be due to increased availability of soil nitrogen, phosphorus and potassium and production of more number of bunches with more weight. Similar results were reported by Bhat *et al*. (2007) in arecanut. Subramanian *et al*. (2012) in their study indicated that the adoption of drip fertigation is a good management technique for improving the coconut productivity. The impact of drip irrigation on arecanut–cocoa system in humid tropics of India assessed by Sujatha and Bhat 2013 also supports the present investigation.

Thus, present investigation indicated that for oil palm under Konkan coastal zone, fertigation @ 1200:600:1800 g NPK in equal six splits could be optimum dose for obtaining higher yield in oil palm.

References

Arulraj, S. (2015). Role of IIOPR in improving Oil Palm productivity. In National Seminar on Promotion of Oil Palm Cultivation in India through NMOOP. 59 pp.

Anonymous, (2012). Oil Palm area assessment report- DOPR and Department of Agriculture and Cooperation, Ministry of Agriculture, New Delhi.

Anonymous, (2014). Report of the 23rd Annual group meeting of All India Coordinated Research Project on Palms.

Bhat, R., S. Sujatha, A.K. Upadhyay and B.V. Ashalatha (2007). Phosphorus and potassium distribution as influenced by fertigation in arecanut rhizosphere. *Journal of Plantation Crops,* **35(2)**: 68-72.

Caliman, J.P. (2009). Oil palm mineral nutrition management. Proceeding of the National Conference on Oil Palm.107 pp.

Gawankar, M.S., R.C. Gajbhiye and S. Arulraj (2010). Nutritional requirement of oil palm in Konkan region. *Journal of Plantation Crops*, **38(3)**: 183-187.

Gomez, K.A. and A.A. Gomez (1984). Statistical Procedures for Agricultural Research. Second Edition, John Wiley and Sons, Inc. Singapore, 655 pp.

Prasad, M.V., C.V. Sairam, S. Arulraj and J. Jameema (2012). Estimation of cost of production of oil palm in Andhra Pradesh. In: Abstract of papers, Plantation Crops Symposium XX, Coimbatore, pp136.

Subramanian, P., R. Dhanapal, A.C. Mathew, C. Palaniswami, A.K. Upadhyaya, S. Naresh Kumar and Reddy, D.V.S. (2012). Effect of fertilizer application through micro-irrigation technique on nutrient availability and coconut productivity. *Journal of Plantation Crops*, **40(3)**:168-173.

Sujata, S. and Ravi Bhat (2013). Impact of drip fertigation on arecanut–cocoa system in humid tropics of India. *Agroforest Syst*., **87(3)**: 643-656.