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Response of water soluble fertilizers on maturity days, productivity per day and yield of banana (*Musa paradisiaca* L.) cv. GRAND NAINE

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ABSTRACT : Application of water soluble fertilizers and micronutrients through drip irrigation is easy, efficient and uniform method with minimum labour involvement to maximize productivity and profit in horticulture crops. The investigation entitled "Response of water soluble fertilizers in banana (*Musa paradisiaca* L.) cv. GRAND NAINE" was conducted at Regional Horticultural Research Station, N.A.U., Navsari during 2011-12 and 2012-13. From economic point of view, 100 per cent RDF water soluble fertilizer (W_3) at 15th days interval and micronutrient Grade- IV at 3rd, 6th and 9th MAP (M1) treatments gave maximum productivity per day (kg/ha) and net realization. So, 100 per cent RDF through water soluble fertilizer successfully reduced crop duration, increase yield (t/ha), maximizing productivity in kg/ha/day and net realization of banana fruit cv. GRAND NAINE.

KEY WORDS : Banana, Productivity, Yield, Net realization

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In term of area and production of banana in India are 8.305 lakh hectares and 297.80 lakh tonnes, respectively. The highest productivity being 62.5 tonnes/ha in Maharashtra followed by Gujarat (61.5 t/ha). In Gujarat, banana covers an area of 0.65 lakh hectares with production of 39.78 lakh tonnes (Anonymous, 2012). Moreover, elements like nitrogen, phosphorus and potash play a vital role in promoting the plant vigour and production and the micronutrients like Fe, Zn, Mn, Cu and B are not only essential but they are equally important like other macro nutrients, in spite of their requirement in micro quantities. Micronutrients are key elements in plants growth and development. These elements play very important role in various enzymatic activities and synthesis (Kumar, 2002 and Das, 2003).

In order to avoid loss of nutrients from conventional method of fertilizers, loss of N through leaching, volatilization, evaporation and loss of P and K by fixation in the soil, application of water soluble or liquid fertilizers through drip irrigation (fertigation) is encouraged. A 25-30 per cent increases in yield observed using fertigation. Moreover, it saves labour and time and the distribution of nutrients is uniform.

RESEARCH METHODS

The present investigation was conducted at Regional Horticultural Research Station, N.A.U., Navsari during 2011- 12 and 2012-13. There were two factors, water soluble fertilizer, (W_1: 50% RDF through water soluble fertilizer, W_2: 75% RDF through water soluble fertilizer, W_3: 100% RDF through water soluble fertilizer, W_4: N and K 60% of RDF [180:90:120g. NPK per plant (drip application of fertilizer)], W_5 Control [RDF 300:90:200 g. NPK per plant (conventional method)]), and two

micronutrient treatments, M_0: (without micronutrient) and M_1: (30g Grade- IV micronutrient at 3rd, 6th and 9th MAP) in present study. Total ten combinations and three repetitions were laid out in RBD with Factorial concept. The growth characters and yield of banana fruits were studied during the entire period.

RESEARCH FINDINGS AND DISCUSSION

The findings of the present study as well as relevant discussion have been presented under following heads :

Effect of water soluble fertilizer (W) :

Water soluble fertilizers were not effective to reduce maturity period, but an earliness was noted with 100 per cent RDF water soluble fertilizer (W_3). Pooled analysis revealed that significantly minimum days required for fruit maturity after flowering in treatment 100 per cent RDF through water soluble fertilizer (W_3) 114.10 days, which at par with W_2, W_4 and W_5. Treatment 50 per cent RDF through water soluble fertilizer (W_1) noted maximum days taken for fruit maturity after flowering, which was significantly at par with treatment W_5. There was highly significant response of Period of fruit maturity after flowering (days) in 100 per cent RDF through water soluble fertilizer (W_3) of each per plant in the present investigation in Fig. 1. This may be due to nitrogen which is responsible for the formation, growth and development of the cells and accelerating the synthesis of chlorophyll and amino acid which are associated with major photosynthesis process of plants, it causes an increase in the formation of meristematic tissues. Mustaffa (1983) the nitrogen application at higher level significantly increased the girth of pseudostem. Oubahou *et al.* (1987) revealed that at higher levels of N and K in 'Grand Naine' (Giant Cavendish) banana increased the circumference of the pseudostem and reduce period of fruit maturity. Similar results were reported by Upadhyay, 1988; Hazarika and Mohan, 1991; Mahalakshmi *et al.*, 2001 and Srinivas *et al.*, 2001.

The effect of water soluble fertilizer was significant on the weight of bunch. The higher bunch weight was noted in treatment of 100 per cent RDF through water soluble fertilizer (W_3) as 29.49 and 31.76 kg, which was at par with treatments W_2 (75% RDF through water soluble fertilizer) during first year and second year experimentation, respectively in Fig. 2. On the other hand, marginal weight of bunch has found in treatment with reduction of 50 per cent RDF through water soluble fertilizer (W_1), which was similar to W_4 and W_5 during first and second year. From the pooled mean, similar

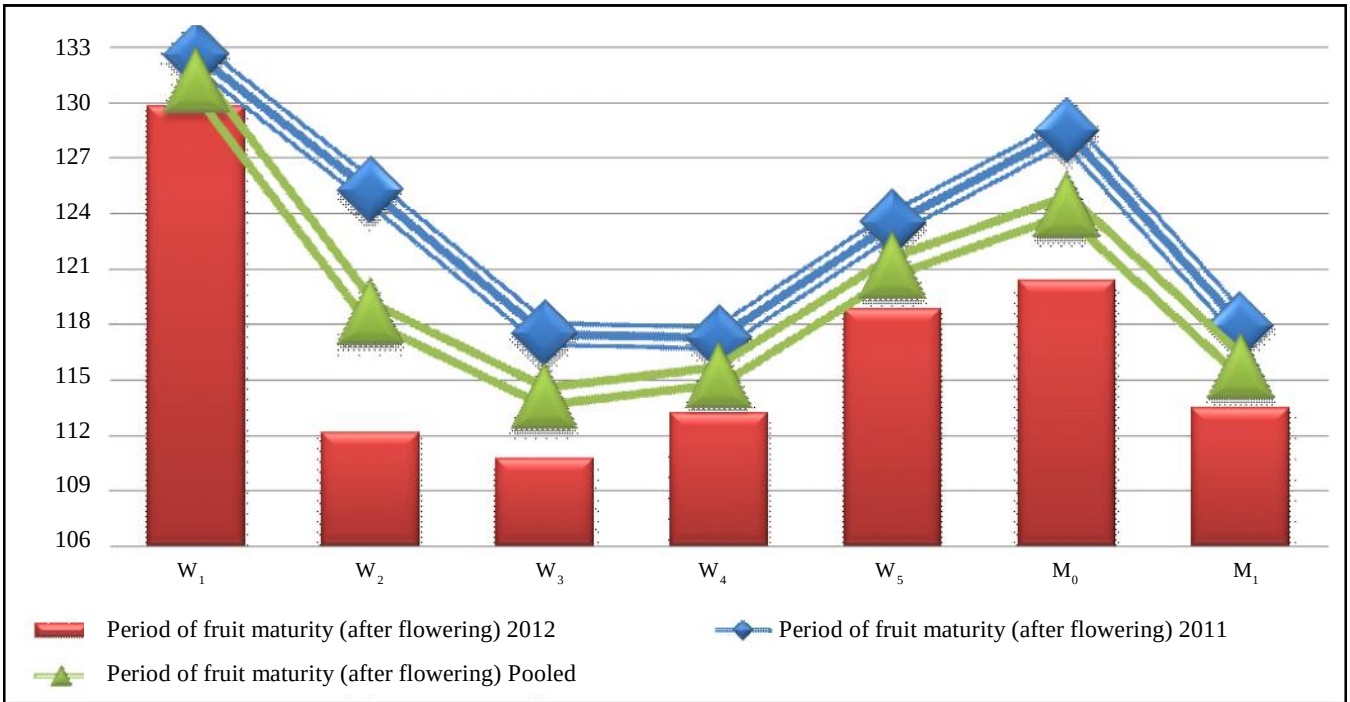

Fig. 1 : Effect of water soluble fertilizer and micronutrient on period of fruit maturity after flowering (days) of banana cv. GRAND NAINE

treatment give significant result with respect to heavy weight of bunch *i.e.* W_3 (100% RDF through water soluble fertilizer) as 30.63 kg, which was followed by W_2 (75% RDF through water soluble fertilizer). Whereas, light weight of bunch was noted in W_1 (50% RDF through water soluble fertilizer) treatment.

The adequate levels of nutrients in the present study *i.e.*, were 300g N, 90g P and 200g K per plant through water soluble fertilizer (W_3) had maximized the finger per hand, finger weight, bunch weight and yield over other treatments. The lower yield of banana recorded under lower levels of nitrogen might be due to the slow growth of plant, small leaf size, delay in flower emergence, less number of hands and fingers per bunch (Hazarika and Mohan, 1991). Teaotia *et al*. (1972) revealed that yield per plant increased with higher levels of fertilizers. The nutrients N and K at higher rate exerted a significant positive influence on bunch weight (Subramanian and Pillai, 1997). Higher bunch weight was observed at higher levels of N and K by Oubahou *et al.*, 1987.

Banana fruit yield was observed significantly higher in an application of 100 per cent RDF through water soluble fertilizer (W_3) treatment as (102.39 t/ha) in the first year, which was statistically at par with treatment W_2 (75% RDF through water soluble fertilizer). Significantly, minimum yield per ha was observed as 54.26 t/ha in treatment reduction of 50 per cent RDF through water soluble fertilizer (W_1), which was at par W_4 and W_5 in Fig. 3. During second year and pooled study, maximum yield per ha was recorded as 110.29 and 106.34 t/ha, respectively in same treatment, which was at par with W_2 in second year only. However, significantly minimum yield per ha have noted in treatment of W_1 (50% RDF through water soluble fertilizer) data presented in higher bunch weight was observed at higher levels of N and K by Oubahou *et al.*, 1987 and Subramanian and Pillai (1997).

Fig. 4 shows that productivity in kg/ha/day was affected significantly with different levels of fertilizers. This might be due to the fact that, it depends on inflorescence, duration of crop for maturity and yield. Higher productivity was found in treatment fertilize 100 per cent RDF through water soluble fertilizer (W_3) and 30g micronutrient Grade- IV at 3rd, 6th and 9th MAP (M_1).

Effect of micronutrient (M) :

Treatment with 30g Grade- IV micronutrient per plant at 3rd, 6th and 9th month after planting (M_1) was significantly reduced the number of days for fruit maturity after flowering of banana in pooled average mean and recorded as 115.69 days as compared to M_0 (Without

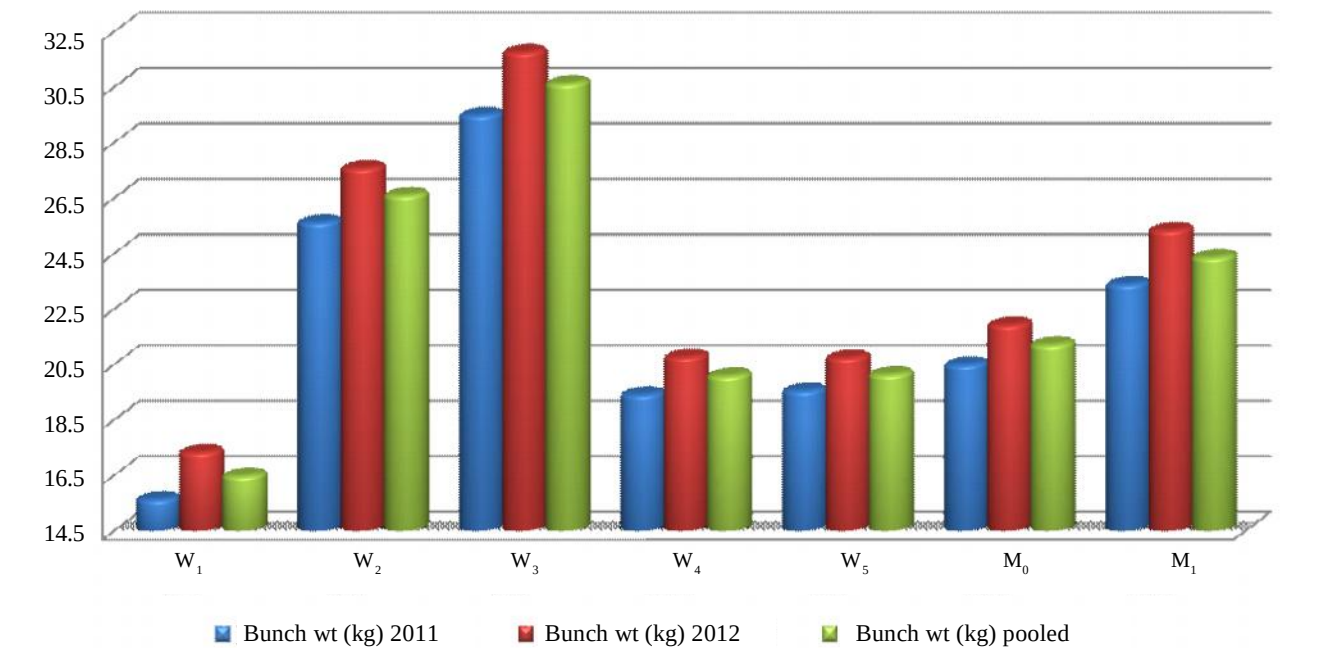

Fig. 2 : Effect of water soluble fertilizer and micronutrient on bunch weight (kg) of banana cv. GRAND NAINE

micronutrient). Fig. 1 shows Period of fruit maturity after flowering (days) was significantly influenced by micronutrients. Rate of 30 g micronutrient Grade -IV at 3rd, 6th and 9th month after planting (M_1) was resulted in maximum total leaf area per plant. It might be due to zinc which stimulates photosynthetic activity and its presence is important for protein synthesis resulted in increase in size and numbers of leave, these leaves produce more food material and complete the growth of plant. Higher total leaf area of leaves due to the zinc was also reported by Das and Mohan (1993) and Yadav (2005) in banana, Shirvastava (1969) in pineapple and Singh and Rajput (1976) in mango.

Fig. 2 indicate that treatment of micronutrient (30 g

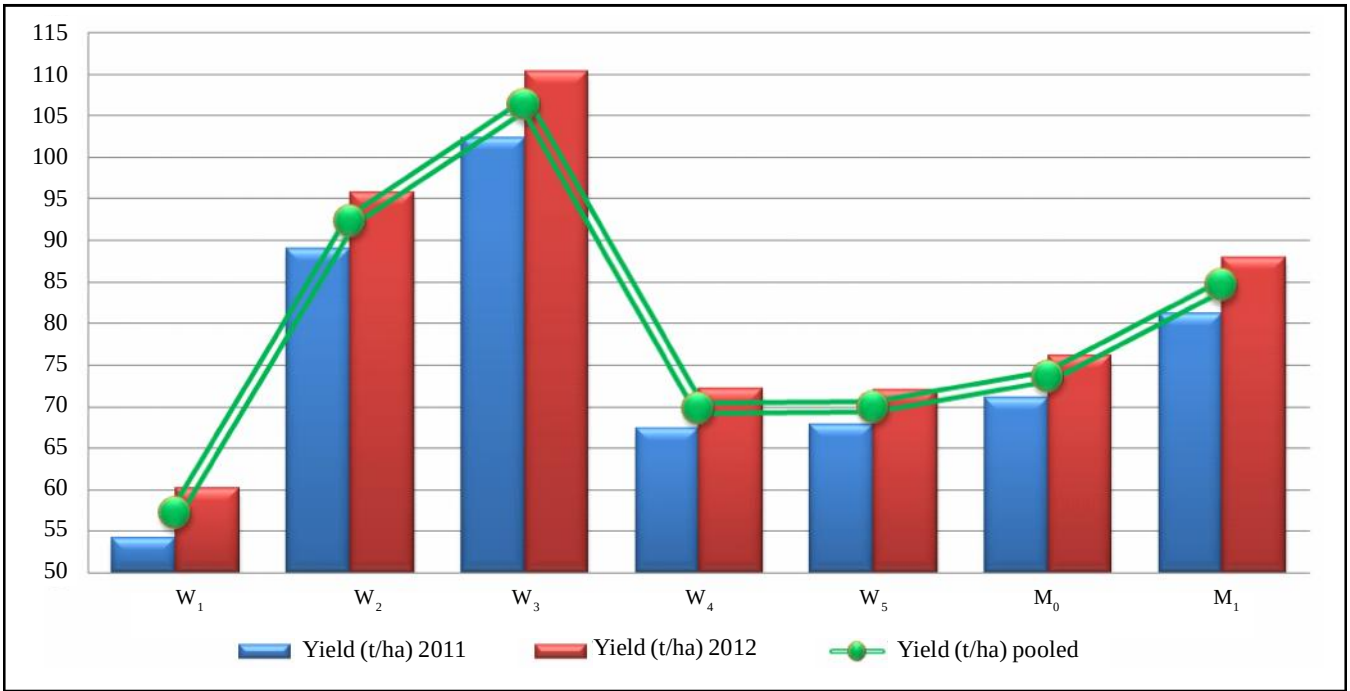

Fig. 3 : Effect of water soluble fertilizer and micronutrient on yield (t/ha) of banana cv. GRAND NAINE

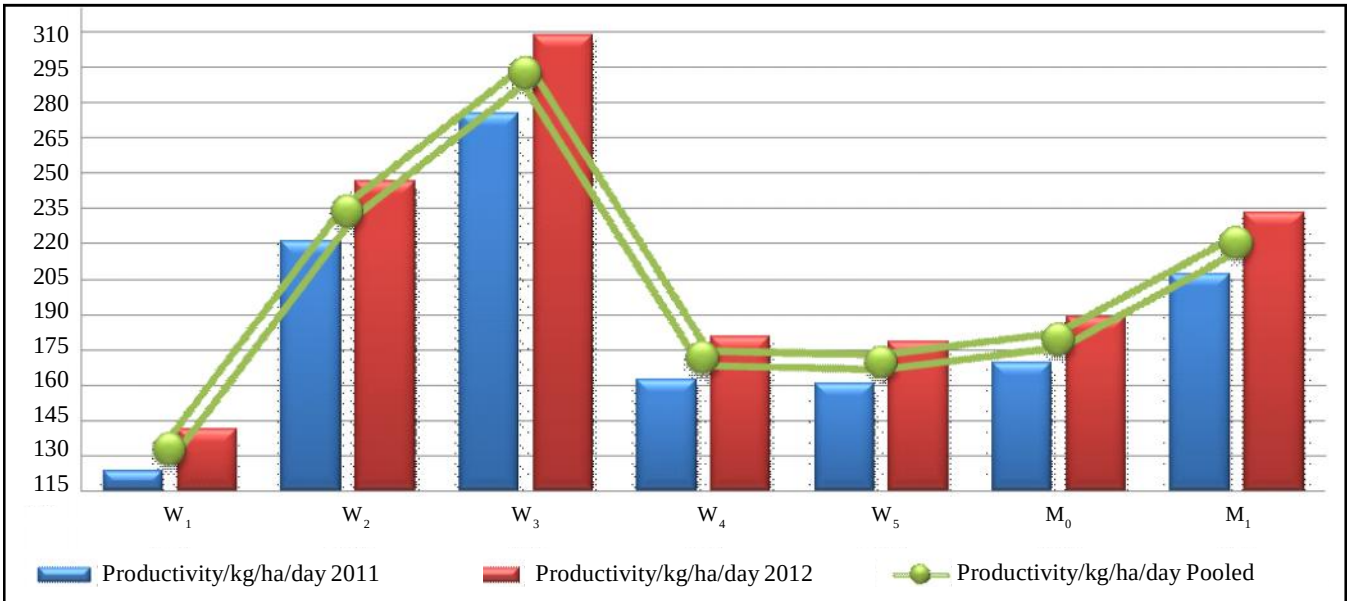

Fig. 4 : Effect of water soluble fertilizer and micronutrient on productivity in kg/ha/day of banana cv. GRAND NAINE

Grade- IV) at 3rd, 6th and 9th month after planting (M_1) was found superior with respect to bunch weight as compared to without micronutrient (M_0). The average weight of finger was significantly altered due to the micronutrients. The dose (30g) of Grade- IV micronutrient@ 3rd, 6th and 9th month after planting directly associated with the better vegetative growth at different stages, increased number of leaves and total leaf area which resulted in to increased synthesis of food material which was reflected as higher number of fingers per hand, weight of finger, number of hands per bunch and weight of bunch and yield in treated plants. The most outstanding effect of zinc on yield was due to favorable effect on finger weight attributing characters. Similar results were also found by Abdel- Kader *et al*. (1990); Hegde and Srinivas (1991); Ghanta and Mitra (1993); Dutta and Dhua (2002); Hosam El-Deen (2002); Yadav (2005); Mostafa and Abdel- Kader (2006) in banana.

Considering the effect of micronutrient treatments on yield of banana per ha was presented in Fig. 3 and indicated that micronutrient treatments found significant result only in pooled mean. Treatment of micronutrient as 30g Grade- IV at 3th, 6 th and 9 th month after planting (M_1) was found superior with respect to yield of banana per ha as compared to without micronutrient (M_0). Directly associated with the better vegetative growth at different stages, increased number of leaves and total leaf area which resulted in to increased synthesis of food material which was reflected as weight of bunch and yield in treated plants. The most outstanding effect of zinc on yield was due to favorable effect on fruit weight attributing characters. Similar results were also found by Ghanta and Mitra (1993); Yadav (2005); Mostafa and Abdel- Kader (2006) in banana.

The effect of micronutrient treatments was significantly affected the productivity/kg/ha/day in the present investigation in Fig. 4. It was recorded as 207.15 kg/ha/day and 233.31 kg/ha/day, in the treatment with application of 30g per plant Grade- IV micronutrient at 3rd, 6th and 9th MAP (M_1) during first year and second year, respectively. Similar trend was observed in pooled average mean and maximum value of productivity per day was recorded as 220.23 kg/ha/day in banana cv. GRAND NAINE receiving in treatment M_1 (With micronutrient) as compared M_0 (Without micronutrient). This might be due to the fact that, it depends on inflorescence, duration of crop for maturity and yield.

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