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EFFECT OF UNICONAZOLE SOIL APPLICATION ON GROWTH, YEILD AND QUALITY OF MANGO FRUITS (*Mangefera indica L.*) CV. LANRA

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ABSTRACT

Effect of unicocazole soil application on vegetative growth , flowering , sex ratio , fruil set , yield and fruit quality of mango cv. Langra were assessed in the season of application (1996/97) and in the following season (1997/98) uniconazlle doses at 0.0, 2.5 , 5.0 and 10g / tree were given twice during the first week of November , 1996 and March , 1997 results indicated that all uniconazole treatments suppressed vegetative flushing and reduced shoot length and leaf area than the control in both " on" and off – years .

Uniconazole application advanced the time of flower bud opening especially in the season of application. Uniconazole treatments significantly improved the percentage of flowering shoots , sex ratio , fruit set and retention and fruit yield compared to the control in both " on and off – years. All uniconazole doses decreased average fruit weight than the control, the smallest fruit weight was produced with (10 g / tree). uniconazole application increased TSS and vitamin c in the fruit juice , while acidity , reducing and total sugar were not significantly affected , It could be concluded that 5 g/tree of uniconazole was superior than 10 g/tree concerning most of the studies traits .

INTRODUCTION

An attempt was made to study the effectiveness of paclobutrazo of gibberellin biosynthesis on regulating vegetative growth, tree vigour, size, flowering, fruit set, yield and quality of fruits in mango. There is a consensus that soil application of growth retardant is more effective than foliar sprays to control tree growth, Kulkarni (1988), Burondkar and Gunjate (1991) Singh *et al*. (1992), Werner (1993) and Zora (2000). Paclobutrazol is a growth retardant that has provided exciting results on several cultivars of mango. Initial evaluation of paclobutrazol in mango was done to tree size by suppressed vegetative flushing in cv. Alphonso (Reju and Iyer, 1993 a), On the other hand, Ferrari and Sergent (1996) found that paclobutrazol application increased the percentage of reproductive shoots compared with control trees in mango cv . Haden. Paclobutrazol application reduced shoot length in 5 mango cvs , Kulkarni (1988) , Reju and Iyer (1993 a) . Werner (1993) Salazer – Garcia and Vazquez.-Valdivia (1997), Subhadrabandhu *et al*. (1999) and Zora (2000) Reju and Iyer (1993 a) and Werner (1993) they found that paclobutrazol application reduced leaf number and area in mango cv. Alphonso and Blanco. Earliness of flowering has shown variable results, as influenced by cultivrs and rate of paclobutrazol used. Earliness varied from one week (Tongumpai *et al*., 1991) to four and eight week's (kulkarni, 1988 and Burondkar and Gunjate 1993). Salazar – Garcia and Vazquez – Valdivia (1997) found that, increasing paclobutrazol rate increased the earliness of flowering in the first year. For the

second year after treatment, the effect of paclobutrazol time to flowering started to decline in mango cv. Ratna, Burondkar *et al*. (2000) observed that residual paclobutrazol in the soil in paclobutrazol treatments of 7.5 and 10 g was sufficient to promote earlier flowering compared with the control in mango cv . Alphonso. On the other hand, flowering of paclobutrazol – treated trees was significantly and linearly advanced compared with the control in mango cv. Alphonso and Tommy Atkins, Ferrari and Sergent (1996), Burondkar and Gun Jate (1997), Josh *et al*. (1998) and Burundkar *et al.* (2000) paclobutrazol application promoted flowering in treated trees than in non–treated in 4 mango cvs, Kulkarni (1998), Reju and Iyer (1993 b), Miao *et al*. (1994) Burondkar and Gunjate (1997) , Subhadrabandhu *et al*. (1999) and Zora (2000) whereas, Burondkar *et al* (2000) observed that residual paclobutrazol in the soil was sufficient to promote more abundant flowering compared with the control. Paclobutrazol application increased the percentage of hermaphrodite flowers in mango cv . Alphonso and Dusheri, Reju and Iyer (1993b), Burondkar *et al*. (2000) and Zora (2000) and Zora (2000). Paclobutrazol application increased fruit set in 3 mango cvs, Buromdkar and Gunjate (1991), Reju and Iyer (1993 b) Burandkar and Gunjate (1997), Subhadrabandhu *et al*. (1999) and Zora (2000) However this difference was absent during the second year (Burondkar and Gunjate 1991). This was probably due to a decrease of the trees nutritional levels following excessive production as suggested by Hillier and Rudge (1991) Reju and Iyer (1993 b) found that highest concentration of paclobutrazol had a detrimental influence on fruit retention, Dosthuyse and Jacobs (1996) revealed that fruits retained and tree yield were not affected with increasing rate of paclobutrazol applied in cv. Sensation while, in Tommy Atkins, number of fruit retained and tree yield were decreased with increasing rates of paclobutrazol applied. Similar result was obtained by Reju and Iyer (1993c). Paclobutrazol application increased yield in 4 mango cvs; Singh and Dhillon (1992) Burondkar and Gunjate (1993), Reju and Iyer (1993 c) Miao *et al*. (1994), Ferrari and Sergent (1996), Burondkar and Gunjate (1997) , Sergent *et al*. (1997) Yadava and Singh(1998) Burondkar *et al*. (2000) and Zora (2000). On the other side, Yadava and Singh (1998) indicated that paclobutrazol needs to be applied annually to increase mango fruit yields cv., Dashehari. Whereas, Burondkar *et al.* (2000) observed that residual paclobutrazol in the soil was sufficient to promote higher yields compared with the control. Paclobutrazol application reduced alternate bearing in mango cv. Haden, Sergant *et al*. (1997) Ferrari and Sergant (1996) and Salazar-Garcia and Vazquez-valdivia (1997) pointed out that all paclobutrazol rates decreased average fruit weight in mango cv. Haden and Tommy Atkins. However, Reju and Iyer (1993c) revealed that physical characters fruits were not affected by higher doses of paclobutrazol. Also, they found that higher doses of paclobutrazol induced TSS. On the other hand, Salazar, Garcia and Vazquez-Valdivia (1997) found that TSS content of fruit juice was not affected at low paclobutrazol rates (2.5 and 5 g/tree), but it was significantly higher with 10 g paclobutrazol per tree in mango cv. Tommy Atkins. Reju and Iyer (1993c) revealed that chemical characters of fruits were not affected by higher doses of paclobutrazol. In mango, 10 g paclobutrasol per tree gave the desired effects for at least two years in five year old bearing trees (Kulkarni, 1988). Similar

results were obtained with repeated applications of paclobutrazol to Valencia mango trees (Goguey, 1990).

The objective of this investigation was to study the feasibility of using uniconazole, as well as to quantify the persistence of uniconazole applied as a soil drench on vegetative growth, flowering behaviour, sex ratio, fruit set and retention, yield and quality on mango cv. Langra.

MATERIALS AND METHODS

Twenty four Langra mango trees grafted on seedling rootstock, 12 years old and nearly similar in vigour were used. The trees were growing in a 7 x 7 m arrangement in sandy soil, received the same horticultural practices and irrigated with drip system at El-Kassasein Research Station, Ismalia governorate, Egypt. The concerned trees were divided into two groups, the first in on-year and the second in off-year according to previous season, each group, twelve trees, were divided into four treatments, three replicates each. The effect of uniconazole was followed up for two consecutive seasons 1996/1997 and 1997/1998 of the study.

Uniconazole at 0.0, 2.5, 5.0 and 10.0g per tree were applied to soil twice; prior to flower and differentiation during the first week of November, 1996 (Singh and Dhillon, 1992) and March, 1997 to individual trees. Each dosage was dissolved in 5L of water and was given as a soil drench over the drip zone. The trees were irrigated 48h after treatment.

The percentage of new vegetative shoot was calculated from 20 shoots selected randomly on each tree. Length of shoots (cm) was measured. Leaf area was determined using leaf area meter (model CI-203, USA). The extent of flowering was calculated form 20 randomly selected shoots on each tree during flowering peak. Five panicles were selected at random on each tree and tagged for fruit set calculation at pea size and fruit retention as:

$$\frac{\text{No. of fruit per panicle at harvest}}{\text{No. of fruit per panicle at pea stage}} \times 100$$

An estimate of sex ratio hermaphrodite/ total flower) was obtained by observing 300 flowers randomly from the three parts of each tagged panicle. Fruit yield per tree was recorded. Ten mature fruits were selected from each tree randomly and stored under laboratory conditions until ripe, for recording physico-chemical characters. Total soluble solids percentage (TSS %) was determined by a hand refractometer, acidity (expressed as a percentage of citric acid) by titrating against standard Na OH solution using phenolphthalein as an indicator, sugars were determined according to the method of Lane and Eynon outlined in A.O.A.C. (1975) and Ascorbic acid (vitamin c) was determined using 2,6-dichlorophenol indophenol dye and 2 % Oxalic as a subtract. Vitamin C content was calculated as mg/100 gm/pulp (A.O.A.C, 1960).

This experiment was arranged in a complete randomized design with three replications for each treatment. Means comparison were made using I.S.D test, Snedecor and Cochran (1980).

RESULTS AND DISCUSSION

Percentage of new vegetative shoots:

Results shown in Tables (1&2) for the seasons under study, reveal that all uniconazole treatments significantly gave lesser values than the control. The highest doses (5 and 10g tree) caused the highly significant reduction the percentage of new vegetative shoots. Similar reduction was found by Reju and Iyer (1993a) who revealed that paclobutrazol application suppressed vegetative flushing. On the other hand, Ferrari and Sergent (1996) who found that paclobutrazol application significantly increased the percentage of reproductive shoots compared with control.

In both seasons of investigation, the differences between "on" and off-year were significant; the on-year gave lower values of the percentage of new vegetative shoots than the off-year.

In the two seasons of investigation, the differences between biennial bearing habit and uniconazole treatments were significant. These results confirm the previous conclusion that higher doses caused the highly significant reduction the percentage of new vegetative shoot than the control in both on and off-year (Reju and Iyer 1993a)

Length of shoots

Results shown in Tables (1&2) for the seasons under study indicated that all uniconazole treatments significant, gave lower values than the control. The highest doses (5 and 10g/tree) caused the highly significant reduction in shoot length. These data are in accordance with those reported by Kulkarni (1988), Werner (1993), Reju and Iyer (1993a), Salazer-Garcia and Vazquez - Valdivia (1997), Subhadrabandhu *et al*. (1999) and Zora (2000) as they found that shoot length was significantly reduced with paclobutrazol application.

In both seasons of investigation, the differences between “on “and off-year were significant, the on-year gave lesser values in shoot length than the off-year.

In the two seasons of investigation, the differences between biennial bearing habit and uniconazole treatments were significant. These results confirm the previous conclusion that higher doses caused the highly significant reduction in shoot length than the control in both on and off-year (Kulkarni 1988, Werner 1993, Reju and Iyer 1993a, Salazer-Garcia and Vazquez - Valdivia 1997, Subhadrabandhu *et al*. 1999 and Zora 2000).

Leaf area per shoot:

Results shown in Tables (1&2) for the seasons under study reveal that, the differences between uniconazole treatments were significantly, all treatments gave lower values than the control.

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The highest doses (5 and 10g/tree) caused the highly significant reduction in leaf area. These results are confirmed with Reju and Iyer (1993a) and Werner (1993) as they found that leaf number and area were reduced by paclobutrazol application.

In both seasons of investigation, the differences between “on” and off-year were significant, the on –year gave lesser values in leaf area than the off-year.

In the two seasons of investigation, the differences between biennial bearing habit and uniconazole treatments were significant. These results confirm the previous conclusion that higher doses caused the highly significant reduction in leaf area than the control in both on and off-year (Reju and Iyer 1993a and Werner 1993).

Time of flowering

All uniconazole treatments evaluated resulted in earlier flowering than the control trees in the season of application and the season after application. Increased uniconazole treatments increased the earliness of flowering from 6 days (2.5 g/tree) to 17 days (10g/tree) in the season of application. The intermediate dose (5g/tree), caused flowering 13 days ahead of control trees.

For the season after application, the effect of uniconazole on flowering date started to decline. The decline was more obvious for treatments of 2.5 and 5g/tree as they were only 2 and 7 days in advance of the control trees. Uniconazole treatment of 10g/tree still showed a substantial effect on earliness of flowering as they were 14 day ahead of untreated control tress (data no shown). These data are in harmony with those reported by Kulkarni (1988) Tongumpai *et al*. (1991), Burondkar and Gunijate (1993), Ferrari and Sergent (1996), Burondar and Gunjate (1997), Salazar-Garcia and Vazquez-Valdivia (1997) and Burondkar *et al.* (2000)

Percentage of flowering shoots:

Results shown in Tables (3&4) for the seasons under study, indicate that , all uniconazole treatments significantly increased the percentage of flowering shoots than the control, The highest doses (5 and 10g/tree) caused the highly significant increased with no significant difference between in the season after application. These results are in agreement with those reported by Kulkarni (1988), Reju and Iyer (1993b), Miao *et al.* (1994), Burondkar and Guniate (1997), Subhadrabandhu *et al*. (1999) and Zora (2000) as they found that paclobutrazol application promoted flowering in treated trees than in control trees. On the other hand, Burondkar *et al* (2000) observed that residual paclobutrazol in the soil was sufficient to promote more abundant flowering compared with the control.

In both seasons of investigation, the differences between "on" and off-year were significant; the on-year gave higher values as the percentage of flowering shoots than the off-year.

In the two season of investigation, the differences between biennial bearing habit and uniconazole treatments were significant than the control.

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These results confirm the previous conclusion that the highest doses caused the highly increased the percentage of flowering shoots than the control in both “on” and off-year (Kulkarni 1988, Reju and Iyer 1993b, Miao *et al.* 1994, Burondkar and Guniate 1997, Subhadrabandhu *et al*. 1999 and Zora 2000).

Sex ratio:

Results shown in Tables (3&4) for the seasons under study, indicated that in the season of application uniconazole treatments significantly increased sex ratio, all treatments gave higher values than the control, uniconazole application at 5g/tree caused the highly significant increased than the control. These data are in accordance with those reported by Reju and Iyer (1993b), Burondkar *et al.* (2000) and Zora (2000), as they found that paclobutrazol application increased the percentage of hermaphrodite flowers. In the season after application, the scored values indicate that all the uniconazole doses increased these criteria with no significant deference.

In both seasons of investigation, the differences between "off" and on –years were significant, the on-year gave higher values sex ratio than off-year.

In the season of application the differences between biennial bearing habit and uniconazole treatments were significant. These results confirm the previous conclusion that uniconazole application at 5g/tree caused the highly significant increased sex ratio than the control in on and off year. In the season after application, all doses of uniconazole increased sex ratio with no significant difference.

Fruit set at pea stage:

Results shown in tables (3&4) for the seasons under study reveal that, all uniconazole treatments significantly increased fruit set at pea stage, uniconazole application at 5g/tree caused the highly increased than the control. When compared with the 2.5 and 5g/tree, doses no significant difference was detected between the lowest and highest doses in the season of application. These finding are in line with there reported by Burondkar and Gunjate (1991), Reju and Iyer (1993b), Burondkar and Gunjate (1997), Subhadrabandhu *et al*. (1999) and Zora (2000), as they found that pacolbutrazol application increased fruit set. However, this difference was absent during the season after application, similar effect were found by Burondkar and Gunjate (1991). This was probably due to a decrease of the tree’s nutritional levels following excessive production as suggested by Hillier and Rudge (1991).

In both season of investigation, the differences between on and off-year were significant, the on-year gave higher values the percentage of fruit set than the off-year.

It appears from Tables (3&4) that during the two seasons of investigation, the differences between biennial bearing habit and uniconazole treatments were significant. These results confirm the previous conclusion that uniconazole application caused the highly increased in both on and off-year.

Fruit retention:

Results shown in Tables (3&4) for the seasons under study, reveal that, all uniconazole treatments significantly increased fruit retention, uniconazole dose at 5g/tree caused the highly increased than the control when compared with both the 2.5 and 10g/tree doses, no significant difference was detected between the lowest and highest doses in the season of application while in the season after application the difference were significant between them. The maximum fruit retention were scored on trees given (5g/tree) in both seasons. These results are confirmed with, Reju and Iyer (1993b) who found that the highest concentration of paclobutrazol had a detrimental influence on fruit retention. On the other hand, Dosthuyse and Jacobs (1996) revealed that fruits retained were not affected with increasing rate of paclobutrazl applied in cv. Sensation while, in Tommy Atkins number of fruit retained were decreased with increasing rates of paclobutrazol.

In both seasons of investigation, the differences between “on “ and off-year were significant, the on-year gave higher values the percentage of fruit retention then the off-year.

In the two seasons of investigation, the differences between biennial bearing habit and uniconazole treatments were significant, these results confirm the previous conclusion that uniconazole at 5g/tree caused the highly increased in both “on “ and “off “year.

Fruit yield:

Results shown in Tables (3&4) for the season under study indicate that, all uniconazole treatments significantly increased fruits weight per tree compared to control. Uniconazole at 5g/tree was superior in this regard. These results are in agreement with those reported by Singh and Dhillon (1992), BurondKar and Guniate (1993), Reju and Iyer (1993c), Miao et al. (1991), Ferrari and Sergent (1996), Burondkar and Gunjate (1997), Sergent *et al*. (1997), Yadava and Singh (1998), Bruoundkar *et al* (2000) and Zora (2000) as they indicated that pacolbutrazol application increased yield . On the other hand, Dosthuyse and Jucobs (1996) showed that tree yield were not affected with increasing rates of paclobutrazol applied in mango cv. Sensation while, in Tommy Atkins tree yield were decreased with increasing rates of paclobutrazol applied . Similar result was obtained by Reju and Iyer (1993 c).

In both seasons of investigation, the differences between "on" and off – year were significant, the on-year gave higher values the percentage of fruit weight per tree than the off-year. These results are confirmed with Sergent *et al.* (1997) who found that paclobutrazol application reduced alternate bearing.

In the two seasons, of investigation, the differences between bennial bearing habit and treatments were significant. These results confirm the previous conclusion that uniconazole at 5 g / tree caused the highly increase in both “on” and off-year.

Physical Characters:

Data shown in Tables (5 & 6) for the seasons under study indicate that, uniconazole treatments significantly decreased average fruit weight. Uniconazole application at l0 g / tree caused the highly significant reduction than the control. These data are in harmony with those reports by Ferrari and

Sergent (1996) and Salazar-Garcia and Vazquez-Valdivia (1997) who indicate that paclobutrazol application decreased average fruit weight.

Results in Tables (5 & 6) prove that, uniconazole application has affected peel weight markedly the season of application as well as the season after. Results indicate that a significant reduction in these criteria was detected the season of application when the trees soil drench with 2.5 and 10 g / tree while it decreased by using the intermediate dose (5g/tree) with no significant difference compared with control. The scored values of the season after application indicate that the tested doses increased these criteria with no significant difference.

Data presented in Tables (5 & 6) indicate that, average seed weight was not affected significantly the season of application with uniconazole application, although the obtained values were lesser than the control. The scored values the season after application indicate that a significant reduction in this criteria when trees were soil drench with 10g / tree while it increased significantly by using lowest doses (2.5 and 5 g / tree) with no significant differences between . However, Reju and Iyer (1993 c) revealed that physical characters fruits were not affected by higher doses of paclobutrazol .

Chemical Characters:

Data shown in Tables (5 & 6) for the seasons under study, indicated that, all uniconazole treatments significantly increased TSS of fruit juice, the highest doses (5 and 10 g / tree) caused the highly increased than the control . These results are confirmed with , Reju and Iyer (1993 c) who found that higher doses of paclobutrazol induced TSS .On the other hand , salazar-Garica and Vazquez-Valdivia (1997) found that TSS content of fruit juice was not affected at low paclobutrazol rates (2.5 and 5 g / tree) , but it was significantly higher with (10g/tree) .

Acidity of mango fruit was not affected in both seasons, as although, all uniconazole doses decreased acidity than the control but the statistical difference was not significant.

Vitamin C of fruit juice was not affected significantly the season of application by uniconazole soil drench with (2.5 and 59 g/ tree) although the obtained values were higher than the control. The highest dose (10g/tree) showed supperior in this regard as it increased this criteria significantly than the control. Worth mentioning that, difference between (2.5 and 5 g / tree) was not significant. V.C was not affected completely the following season of application as although all uniconazole doses increased V.C than the control but statistical difference was not significant.

Concerning, reducing and total sugar as affected by uniconazole doses, this traits were not affected significantly in both seasons as although all uniconazole doses increased it than the control.

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تأثيـر المعاملــة الإرضــى لمــادة اليونيوكونازول على نمو ومحصول وجودة ثمار المانجو صنف اللانجرا .

علاء الدين ثابت ابو العز
كلية الزراعة جامعة جنوب الوادى

الثمار والمحصول وصفات جودة ثمار المانجو صنف اللانجرا تم دراستها لموسمي ٩٦ / ١٩٩٧ ، ٩٧ / ١٩٩٨ بمحطة بحوث القصاصين، تم تطبيق المعاملة بمادة اليونيكونازول بالجرعات ٢,٥ , ٥ , ١٠ , جرام لكل شجرة مرتين خلال الأسبوع الأول من نوفمبر ١٩٩٦ وفى مارس ١٩٩٧ النتائج أوضحت أن :-

كل معاملات اليونيكونازول أدت إلى نقص النموات الخضرية الحديثة وإختزلت طول الفرخ ومساحة الورقة مقارنة بالأشجار غير المعاملة فى كلاً من سنة الحمل الخفيف والثقيل للأشجار . معاملات اليونيكونازول أدت إلى تبكير وقت تفتح البرعم الزهرى خصوصاً فى موسم الإضافة . جميع معاملات اليونيكونازول أدت إلى زيادة معنوية فى نسبة الأفرع الزهرية ونسبة الجنس والثمار العاقدة والمتبقية من العقد ومحصول الثمار مقارنة بالأشجار غير المعاملة فى كلاً من سنة الحمل الثقيل والخفيف للأشجار . جميع معاملات اليونيكونازول أنقصت متوسط وزن الثمرة مقارنة بالغير معاملة حيث أصغر الثمار وزن نتجت عن المعاملة (١٠ جرام / شجرة) . معاملات اليونيكونازول أدت إلى زيادة نسبة المواد الصلبة الذائبة الكلية وفيتامين أ فى لب الثمار فى حين الحموضة والسكريات المختزلة والكلية لم تتأثر معنوياً .

يمكن تلخيص ان الجرعة ٥ جرام/ شجرة يونيكونازول أعطت نتائج أفضل من الجرعة ١٠ جرام / شجرة فيما يتعلق بمعظم الصفات المدروسة .