

EFFECT OF PACLOBUTRAZOL AND ZINC SULPHATE ON SPLITTING AND FRUIT QUALITY OF MANFALUTY POMEGRANATE TREES UNDER UPPER EGYPT CONDITIONS.

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ABSTRACT

The effect of paclobutrazol (PBZ) and zinc sulphate at 50,100,150 ppm and 2000,3000, 4000 ppm respectively on splitting, yield and fruit quality of Manfaluty pomegranate cultivar grown in clay soil for 2 seasons were studied. The treatments of zinc sulphate and paclobutrazol were effective in reducing the percentage of fruit splitting during 2001 and 2002 seasons. The significance difference was observed with using 150 ppm (PBZ) during the both seasons. Meanwhile yield/tree were not affected but grains per fruit and percentage of juice reduced significantly differences when trees treated by paclobutrazol and zinc sulphate at 4000 ppm. Total soluble solids, acidity, total sugar and reducing sugar were increased directly as influenced by foliar sprays with zinc sulphate and paclobutrazol and the effect of the later was pronounced.

INTRODUCTION

Manfaluty pomegranate is the most important cultivar in upper Egypt. Splitting of fruits is one of the physiological disorders wherever pomegranate trees are grown. It may be due to irregular irrigation during fruit maturation and ripening or to moisture loosing from peel (Bacha and Ibrahim, 1979). Zinc play an important role in regulating absorption of water by plant roots. Several chemical substances were tried to control fruit Splitting. Singh *et al.* (1990) noted that application of macro nutrients such as 1 % MgSO₄ and 1 % KNO₃ reduced fruit splitting in pomegranate fruits with regular irrigation at weekly intervals. El-Kassas (1984) observed that fruit splitting of Manfaluty pomegranate appears in small percentage during the first two weeks of September. El-Masry (1995) found that soil applications with ZnSO₄ reduced the percentage of splitting pomegranate fruit tree, meanwhile increased fruit yield/tree and juice acidity reduced TSS and reducing sugars but did not reduced peel thickness as compared with those untreated control.

Zhai and zhang (1994) observed that pomegranate trees when applied at 200mg paclobutrazol/liter in late May and mid-July improved growth and fruit bud formation. Curry (1988) noted that apple tree which treated by PBZ as soil or foliar spray increased total soluble solids and reduced fruit acidity. In peach PBZ was more effective in increasing fruit yield/tree (Forlani, 1986, Forlani and Tanco, 1987 and Martein *et al.*, 1987). Paclobutrazol may decrease fruit cell division during the first stage of fruit growth and improve fruit cell enlargement during the flowing stage (Costa *et al.*, 1986 and Blanco, 1990). Forlani and Coppola (1992) applied paclobutrazol in Fiano cv. grapevines as foliar application at 500,1000

and 1500 ppm treatments improved fruit yield/vine whereas had a negative effect on fruit sugar. Also (Abdel- Ghany (1995), Kamel (1993), Sayed (1993) and Wassel *et al.* (1993) Shaltout *et al.* (1988) mentioned that paclobutrazol treated in Roumi Red caused a reduction in the total soluble solids percentage, and total sugar contents but increased total acidity. The main objective of this investigation is to study of the effect of using paclobutrazol and zinc sulfate applied as foliar sprays 9 -10 weeks before fruit harvest on splitting yield and fruit quality of Manfaluty Pomegranate in upper Egypt.

MATERIALS AND METHODS

The present study was carried out during 2001 and 2002 growing seasons on 15 years old Manfaluty pomegranate trees grown in an orchard located at El-Balya District, Sohag Governorate. The trees were planted at 5x5 m apart and received the same horticultural management.

Twenty one trees of similar age and vigour were selected and divided into seven different treatments including the control, the experiment involved the following seven treatments:

1. control treatment (sprayed with tap water).
2. zinc sulphate as foliar sprays at 2000 ppm .
3. zinc sulphate as foliar sprays at 3000 ppm .
4. zinc sulphate as foliar sprays at 4000 ppm .
5. Paclobutrazol as foliar sprays at 50 ppm .
6. Paclobutrazol as foliar sprays at 100 ppm .
7. Paclobutrazol as foliar sprays at 150 ppm .

The experiment was designed as a complete randomized block design with three replicates, and each replicate was represented by one tree.

All treatments were carried out in the first week of June in the both seasons. At the harvest time the number of fruits per tree in each treatment was counted and also the number of splitting fruits was recorded. Then the yield and the percentage of splitting fruits was calculated. Ten normal fruits were taken from each tree for quality determination. The juice was extracted and the total soluble solids were determined by hand refractometer. The acidity of the juice as was determined as citric acid by titration with standard NaOH using phenolphthaleine as an indicator (A.O.A.C, 1985).

The obtained results were subjected to analysis of variance according to Steel and Torrie (1980) using L.S.D for comparing differences between various treatment means.

RESULTS AND DISCUSSION

1. Effect of paclobutrazol and zinc sulphate on fruit splitting:

The present data in Table (1) showed that foliar application with paclobutrazol and zinc sulphate reduced the percentage of splitting fruits in Manfaluty pomegranate cultivar in both seasons. The minimum splitting values were observed by using the highest concentration of Zinc Sulphate and paclobutrazol (4000 and 150 ppm respectively) .

Table (1): Effect of foliar sprays with paclobutrazol and zinc sulphate on splitting, yield/tree and fruit physical properties of Manfaluty pomegranate during 2001 and 2002 seasons.

Treatment	Splitting fruit %		Yield / tree	
	2001	2002	2001	2002
Control	41.04	37.9	70.0	53.0
Zinc sulphate 2000 ppm	38.3	35.6	72.0	52.0
Zinc sulphate 3000 ppm	36.6	33.1	76.0	54.0
Zinc sulphate 4000 ppm	32.7	29.1	69.0	50.0
Paclobutrazol 50 ppm	35.1	31.6	71.0	53.0
Paclobutrazol 100ppm	30.8	28.8	75.0	51.0
Paclobutrazol 150 ppm	26.5	24.1	73.0	55.0
LSD at 5 %	10.3	9.7	NS	NS
Treatment	Grains / fruit		Juice %	
	2001	2002	2001	2002
Control	59.9	58.1	40.3	39.6
Zinc sulphate 2000 ppm	58.2	57.2	39.0	37.5
Zinc sulphate 3000 ppm	57.6	56.4	38.0	37.0
Zinc sulphate 4000 ppm	56.8	55.0	37.5	36.0
Paclobutrazol 50 ppm	56.0	55.0	35.2	34.5
Paclobutrazol 100ppm	55.7	54.3	34.8	33.2
Paclobutrazol 150 ppm	55.0	54.0	33.5	32.0
LSD at 5%	2.36	2.5	1.4	2.2

The differences between treatments and the control did not reach significance, with exception of spraying 150 ppm paclobutrazol in both seasons. These results are in agreement with those obtained by Zhai and Zhang (1994) Ahmed *et al.* (2000), they observed that splitting fruits in Manfalouty pomegranate cultivar were reduced when trees by paclobutrazol were spraying. Also El-Masry (1995) found that fruit splitting were reduced by using zinc sulphate as soil applications in clay soil.

2.Effect of paclobutrazol, and zinc sulphate on yield and physical properties of fruit:

Data in Table (1) show clearly that yield / tree had no significant differences as affected by spraying Zinc Sulphate and Paclobutrazol treatments during the two studied seasons. Meanwhile grains / fruit and percentage of juice showed the lowest effect with spraying Zinc Sulphate at 4000 ppm. Paclobutrazol treatments had also the same and lowest effect. Such results may be due to the effect of these materials in producing smaller gava fruit which an increasing in fruit peel weight percent and reducing fruit grain and juice These results are in harmony with those obtained El-Masry (1995) and Ahmed and *et al.* (2000)

3.Effect of paclobutrazol and zinc sulphate on some chemical properties of fruit

Data in Table (2) shows that total soluble solids were increased but the increase was insignificant when trees received foliar paclobutrazol and zinc sulphate. The best significance result was recorded with paclobutrazol at 150 ppm in both seasons. These results may be due to the effect of spraying

Table (2): Effect of foliar sprays with paclobutrazol and zinc sulphate on some chemical properties of Manfaluty pomegranate during 2001 and 2002 seasons.

Treatment	TSS %		Acidity	
	2001	2002	2001	2002
Control	16.2	16.0	1.2	1.18
Zinc sulphate 2000 ppm	16.4	16.2	1.22	1.24
Zinc sulphate 3000 ppm	16.6	16.4	1.24	1.26
Zinc sulphate 4000 ppm	16.9	16.6	1.25	1.27
Paclobutrazol 50 ppm	16.5	17.0	1.3	1.32
Paclobutrazol 100ppm	17.0	17.3	1.34	1.35
Paclobutrazol 150 ppm	17.5	17.6	1.35	1.36
LSD at 5 %	1.3	1.4	0.08	0.086
Treatment	Total Sugar		Reducing Sugar	
	2001	2002	2001	2002
Control	11.6	11.2	10.8	10.5
Zinc sulphate 2000 ppm	11.8	11.4	10.9	10.6
Zinc sulphate 3000 ppm	12.0	11.8	11.0	10.7
Zinc sulphate 4000 ppm	12.2	12.0	11.2	11.0
Paclobutrazol 50 ppm	13.0	12.4	11.4	11.2
Paclobutrazol 100ppm	13.2	12.6	11.6	11.4
Paclobutrazol 150 ppm	13.4	12.8	11.9	11.6
LSD at 5%	0.49	0.28	0.21	0.27

paclobutrazol which gave smaller fruit size with high concentration of total soluble solids. Total acidity percentage insignificantly increased as the treatments of Zinc sulphate insignificantly increased. Meanwhile, paclobutrazol spray treatments increased total acidity significantly as compared with control. Increase of the total acidity percentage by paclobutrazol may be due to small fruits with a high total acidity percentage of juice. These results are in agreement with those obtained by Curry (1988) noted that in apple trees paclobutrazol spray or in soil increased total soluble solids. Also Ahmed *et al.* (2000) on the other hand Abdel-Ghany (1995) Kamel (1993) Sayed (1993) Wassel *et al.* (1993) and Shaltout *et al.* (1988) they noted that in Roumi Red grape paclobutrazol causes reduction in total soluble solids meanwhile total acidity percentage was increased El-Masry (1995) noted that TSS and reducing sugar were reduced in pomegranate fruit trees when soil application by zinc sulphate.

Total and reducing sugar:

Total and reducing sugar increased directly when fruit trees sprayed with zinc sulphate and paclobutrazol. The results recorded insignificant increase in total and reducing sugar by spraying zinc sulphate at concentration 2000 and 3000 ppm. Spraying with 4000 ppm Zinc Sulphate and 50,100,150 ppm paclobutrazol in both seasons showed significant increase as compared to the control trees. This results are in agreement with those obtained by El-Masry (1995), Abdel-Ghany (1995) and Ahmed *et al.* (2000).

As a conclusion, the best results with regard to splitting and fruit quality of Manfully pomegranate/trees were obtained by foliar spray with paclobutrazol at 150 ppm in the first week of June. The percentage of splitting fruit was significantly reduced meanwhile yield/tree there effectness, grains, fruit and percentage of juice have been reduced but total soluble solids, acidity, total sugar and reducing sugar were increased.

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تأثير البكلوبترازول وسنغات الزنك على التشقق وجودة الثمار فى الزمان المنفلوطى تحت ظروف مصر العليا
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أجريت هذه التجربة خلال موسمی ٢٠٠٠/٢٠٠١ - ٢٠٠١/٢٠٠٢ فى محاولة للتغلب على تشقق ثمار الزمان المنفلوطى وذلك بالرش بكبريتات الزنك بتركيزات ٢٠٠٠، ٣٠٠٠، ٤٠٠٠ جزء فى المليون والبكلوبترازول بتركيز ٥٠، ١٠٠، ١٥٠ جزء فى المليون وذلك فى الاسبوع الاول من يونيو على اشجار بالغة عمرها ١٥ عام نامية فى تربية صفراء والرى سطحى بالغمر فى محافظة سوهاج بصعيد مصر وكانت النتائج كالتالى :-

١- ادى الرش بكبريتات الزنك والبكلوبترازول الى نقص واضح فى عدد الثمار المتشقة مقارنة بالاشجار الغير معاملة (الكنترول) وكان الرش بالبكلوبترازول بتركيز ١٥٠ جزء فى المليون اكثر فعالية وادى الى نقص معنوى واضح مقارنة بالاشجار الغير المعاملة عن باقى التركيزات المستخدمة .

٢- لم يظهر اى تأثير على كمية المحصول نتيجة الرش سواء بكبريتات الزنك او البكلوبترازول فى حين ان عدد الحبات فى الثمرة ونسبة العصير اعطت تناقصا تدريجيا بوجه عام وكان التناقص تدريجى ومعنوى عن الكنترول عند استخدام التركيز الاعلى من كبريتات الزنك او البكلوبترازول فى حيث ان عدد الحبات فى الثمرة ونسبة العصير اعطت تناقصا تدريجيا بوجه عام وكان التناقص تدريجى ومعنوى عن الكنترول عند استخدام التركيز الاعلى من كبريتات الزنك (٤٠٠ جزء فى المليون) والبكلوبترازول عموما .

٣- تأثرت الصفات الكيميائية للثمار نتيجة الرش بكبريتات الزنك والبكلوبترازول حيث زادت معنويا النسبة المئوية للمواد الصلبة الذاتية بالرش بالبكلوبترازول بتركيز وادى الرش بكبريتات الزنك الى زيادة غير معنوية فى النسبة المئوية للحموضة فى حين ان الرش بالبكلوبترازول ادى الى زيادة معنوية فى النسبة المئوية للحموضة .

ادى الرش الى زيادة السكريات الكلية والمختزلة وكانت الزيادة معنوية عند استخدام التركيز الاعلى من كبريتات الزنك والبكلوبترازول بتركيزاته المختلفة .

ويمكن التوصية لتقليل نسبة التشقق فى ثمار الزمان المنفلوطى تحت ظروف محافظة سوهاج والتربة الصفراء والرى بالغمر بالرش بالبكلوبترازول بتركيز ١٥٠ جزء فى المليون فى الاسبوع الاول من يونية مع الاخذ فى الاعتبار ان الثمار الناتجة صغيرة نوعا ما ذات نسبة حموضة مقبولة وسكريات مرتفعة .