J. Agric. Sci. Mansoura Univ., 32 (6): 4659 - 4667, 2007

UTILIZATION OF SOME CHEMICALS FOR STIMULATING WINTER SEASON CROP OF GUAVA.

Hasseb, G. M.
Pomology Dept., Fac. Agri., Cairo Univ., giza, Egypt

ABSTRACT

Selected Guava (Psidium guajava L.) clone of 11 years old, cultivated in clay soil were sprayed with potassium nitrate at 2 & 4 and 6% or ammonium sulphate at 5&10 and 15% at bloom stage. Floral abscission, after two weeks after spraying was enhanced by the two chemical application. Moreover, maximum floral abscission was recorded when trees received to 6% potassium nitrate followed by sprayed with 15% ammonium sulphate. Whereas, the lowest fruit retention of summer crop was caused by 6% potassium nitrate, followed by the ammonium sulphate at 15%, while the control trees recorded the maximum fruit retention. The yield of winter crop was significantly increased by application of potassium nitrate at 6% followed by ammonium sulphate at 5%. Yet, the winter fruits produced from potassium nitrate at 6% or ammonium sulphate at 15% exhibited the highest weight and diameter as well as produced higher T.S.S with low acidity.

INTRODUCTION

Guava is one of the most common and popular fruits in Egypt. It is a delicious fruit that is highly nutritive and exceptionally rich in vitamin c and several useful minerals for human health. So, guava is prelatic and regular-bearing fruit tree that could produce fruit year round (Thoute and Chakrawar, 1982).

Guava is successfully cultivated in wide range of environmental and edaphic conditions because its tolerance to drought and salinity as compared to most of the warm-climate fruit plants (Samson, 1986).

In Guava, the summer season crop is attacked by many insect pest and disease (Pena *et al.,* 2002), this causes heavy loss to the growers as fruits are unsuitable for marketing. In this respect, Singh *et al.* (1991) studied the various cropping patterns, and recommended a signal winter crop in guava in order to harvest highly economical crop of best quality fruits.

In Egypt, guava trees were forced to produce their fruits in winter after some agricultural practices as the trees were prevented from irrigation for three months (mid April till mid July) for defoliation, ploughed, fertilized then irrigated. Most of winter production of guava is exported to other countries, so improving productivity and fruit quality is important issue to earn more commercial advantages. Besides, guava fruits are desired to local marked in winter.

Urea, NAA and ethephon has been applied to guava trees in vigorous vegetative growth to change yield patterns (Shigeura et al., 1975 and Singh *et al*., 1991). Work on guava has been mainly limited to Urea, NAA, KI and ethephon (Gorakh *et al*., 2000). Nevertheless after screening of several readily available chemicals, ammonium sulphate and potassium nitrate were seems to be likely defoliants (Calderbank, 1972).

Singh *et al.,* (1992) successfully obtained defoliation and subsequent

increase in yield in phalsa by using potassium nitrate. Poapst and Anderson, (1983) also proved that sprayed peach trees with ammonium sulphate was highly useful for flower thinning. Whereas, no information with ammonium sulphate and potassium nitrate on guava for crop regulation.

The objective of this investigation was to evaluate the available chemicals of potassium nitrate and ammonium sulphate which may cause the elimination of summer season crop and subsequent enhanced yield in winter season.

MATERIAL AND METHODS

This study was carried out during the two successive seasons of 2003&2004 in a private orchard at El-Kanater, Qalyobia Governorate. The selected trees are 11 years old of El-Kanater selected clone propagated by suckers, healthy and nearly uniform in growth vigour.

Forty two guava trees planted at a spacing of 5 ×5 m. apart in clay soil. From the forty two trees, 36 trees were selected at random for spraying with different concentrations of tested chemicals and the other three trees were sprayed with water as control. The experiment was designed as a randomized block with two trees for each a replicate. Yet all treatments included control trees were represented in three replicates.

Four branches around the periphery of the tree were selected for counting floral and abscission. Flowers and leaves were counted on these selected branches of each tree before application. Three concentrations of potassium nitrate (2.0, 4.0 and 6.0%) and ammonium sulphate (5.0, 10.0 and 15.0%) was used, so 0.1% super film surfactant, was added to the solution were smooth applied to whole trees at bloom stage in a fine warm day (maximum temperature 37°C). Prior to treatment and during the flowering month, all trees received similar horticulture treatments of nutrition, irrigation, pest and disease control and general management.

The obtained data were handled as follows:-

1. Percent leaf and flower abscission.
2. Number of new shoots per branch.
3. Fruit retention (during summer season).

$$\text{Fruit retention} = \frac{\text{No of fruits before harvest}}{\text{No of fruits after fruit set}} \times 100$$

4. New flowering percentage.
5. Yield of summer and winter season.
6. Fruit physical prosperities: fruit weight (g) and fruit dimension (cm) were determined.
7. Fruit chemical prosperities: Total soluble solids (TSS) were determined by A'bbe refractometer according to (A.O.A.C., 1980). Yet, Acidity was estimated as the percentage of anhydrous citric acid. TSS/acid ratio was estimated. Furthermore, Ascorbic acid was estimated according to Horwitz (1970).

Statistical analysis:

Data were tabulated and statistically analyzed according to **Snedecor** and Cochran (1980). Duncan multiple range tests were used to differentiate means at 5% level.

RESULTS AND DISCUSSION

1- Percentage of leaf and flower abscission:-

The effect of tested treatments on the percent of leaf and flower abscission are presented in Table (1). The extent of abscission was significantly differ with various concentrations of potassium nitrate (KNO3) and ammonium sulphate $(NH4)_2SO4$ when applied at bloom stage during the two seasons. Within 15 days after treatment extensive abscission had been induced by different treatments. In the first season, the highest percent of leaf abscission ranged about 71.5% and 68.53% with potassium nitrate at 6% and ammonium sulphate at 15%, respectively. Yet, the lowest percent of leaf abscission was recorded in the control (4.33%) which was significantly lower than other treatments. Furthermore, Data from the second season was almost similar to the first one.

Table (1): Effect of potassium nitrate and ammonium sulphate on leaf and flower abscission (%) of guava trees.

Values followed by the same letter(s) within each season are not significantly different at 5 % level.

Treatment	Leaf abscission (%)			Flower abscission (%)		
	2003	2004	Mean	2003	2004	Mean
Potassium nitrate						
2%	34.40 C	35.67 E	35.04	30.67 G	31.83 G	31.25
4%	68.30 A	69.33 B	68.82	50.67 D	51.33 D	51.00
6%	71.50 A	72.33 A	71.92	64.33 A	65.00 A	64.67
Ammonium sulphate						
5%	37.50 C	38.33 D	37.92	39.50 E	41.17 E	40.34
10%	62.73 B	64.33 C	63.53	54.67 C	54.67 C	54.67
15%	68.53 A	69.17 B	68.85	58.67 B	59.67 B	59.17
Control	4.33 D	3.67 F	4	34.17 F	33.50 F	33.84

Flower abscission had been induced by different treatments, since highest flower abscission at the first season were 64.33% and 58.67% for trees sprayed with potassium nitrate at 6% and ammonium sulphate at 15% respectively. The other treatments presented significant differences between them, while the least significant value was 30.67% was resulted by spraying trees with potassium nitrate at the lowest level 2% as compared to control. In the second season similar trend was also observed with the highest flower abscission was found with potassium nitrate at 6% and ammonium sulphate at 15%.

These results are agree with the findings of Byers and Lyons (1983) who reported that ammonium salt caused satisfactory removal of flower without foliage injury when applied at bloom stage in peach. Observations also indicated that open flowers were more sensitive than closed ones. The action of potassium nitrate and ammonium sulphate seems to be advantageous, because all the tested concentrations of both chemicals

promote the leaf fall, mainly old leaves. Therefore, they appeared to be more specific in their action on mature leaves than closed flowers and flower buds which showed a variety of physiological malfunction. Addicott (1964) has indicated that most defolians have no direct affect on the abscission zone but affect abscission by way of leaf injury which sets in motion the chain of events leading to leaf fall.

Recently, Singh *et al.* (1991) have shown that the major abscission zone of guava is formed at the proximal end of pedicel during bloom. Abscission agent like other plant growth regulator, often work best to enhance a process that can occur naturally.

2- Number of new shoots per branch:-

After defoliation, great increase in induction of new lateral shoots were recorded when trees received to potassium nitrate at 6% and ammonium sulphate at different concentrations than the control at the two seasons (Table 2). However, no significant differences were observed between sprayed trees with 5, 10 and 15% of ammonium sulphate in the first season and 5% and 15 % of ammonium sulphate in the second one.

Higher number of new shoots was probably due to its immediate absorption of chemicals which increased leaf defoliation and subsequent migration of nutrients, specially added nitrogen, into the shoots (Van, 1966). This could responsible for the enhance the number of shoots per branch. Since, flower takes place on newly emerging shoots, it is expected that the fruiting pattern follows the flushing pattern.

3- New flowering percentage:-

The data showed a significant increase in flower bud formation on new shoots in July - September were obtained for trees sprayed with 5% ammonium sulphate, followed by all concentrations of potassium nitrate during two seasons of study (Table 2). However, no significant differences were observed within potassium nitrate concentrations in the first season at 2% and 4% or 4% and 6% in the second one.

Table (2): Effect of potassium nitrate and ammonium sulphate on number of new shoots and new flower (%) of guava trees.

Values followed by the same letter(s) within each season are not significantly different at 5 % level.

Treatment	No. of new shoots per branch			New Flowering (%)		
	2003	2004	Mean	2003	2004	Mean
Potassium nitrate						
2%	26.67 D	38.00 E	32.34	25.33 B	26.17 C	25.75
4%	43.50 C	45.50 D	44.50	27.33 B	28.00 BC	27.67
6%	53.67 BC	55.00 C	54.34	27.50 B	28.83 B	28.17
Ammonium sulphate						
5%	63.33 AB	65.50 B	64.42	47.33 A	48.33 A	47.83
10%	71.00 A	72.00 A	71.50	17.33 C	18.50 D	17.20
15%	62.00 AB	63.00 B	62.50	10.33 D	9.00 F	9.67
Control	41.00 CD	42.00 DE	41.5	13.50 D	13.00 E	13.25

4- Retention percentage of summer fruits:-

It is clear that all treatments reduced fruit retention percentage of summer season as compared with the control in the two seasons. This

reduction in fruit retention was paralleled with the increment of the concentration of both chemicals used. In first season, about 89.67% fruits were eliminated with potassium nitrate at 6% followed by 84.23% with ammonium sulphate at 15% while only 11% of fruits were eliminated on untreated trees (control) during summer season (Table 3). In the second season similar trend was found. Whereas, the great reduction in fruit retention 11.67% was obtained for potassium nitrate at 6% followed by ammonium sulphate at 15% (18.67%).

5- Yield (Kg/tree):-

It is clear from Table (3) that yield of both summer and winter season as Kg/tree was affected significantly by all treatments used at the two seasons of study. In both seasons, potassium nitrate at 6% and ammonium sulphate at 15% were only treatments listed in the tables that caused a significant reduction in fruit yield during summer season compared with other treatments and control.

Table (3): Effect of potassium nitrate and ammonium sulphate on retention of summer fruits% and yield of guava trees.

Values followed by the same letter(s) within each season are not significantly different at 5 % level.

Treatment	Retention of summer fruits (%)			Yield (Kg/ tree)					
				Summer season			Winter season		
	2003	2004	Mean	2003	2004	Mean	2003	2004	Mean
Potassium nitrate									
2%	80.33 B	81.50 B	80.92	51.70 B	52.30 B	52.00	32.10 B	34.10 C	33.10
4%	55.33 C	56.50 C	55.92	50.50 B	49.70 C	50.10	36.40 B	36.40 B	36.40
6%	10.33 F	11.67 G	11.00	38.50 D	39.20 E	38.20	44.90 A	45.70 A	45.30
Ammonium sulphate									
	52.67 C	52.33 D	52.50	49.90 B	50.30 C	50.10	44.10 A	45.10 A	44.60
5%	32.33 D	33.50 E	32.92	42.20 B	41.30 D	41.75	27.10 C	28.50 D	27.80
10%	15.77 E	18.67 F	15.77	12.70 E	13.60 F	13.15	24.60CD	25.40 E	25.00
15%									
Control	89.00 A	90.33 A	89.67	67.50 A	68.10 A	67.8	21.50 D	22.60 F	22.05

However, the yield of winter crop was increased with 6% potassium nitrate (44.90 Kg/tree) followed by ammonium sulphate at 5% (44.10 Kg/tree) as compared to 21.50 Kg/tree for the untreated trees. The present findings confirm the observations of Reddy (1987) who reported that fruit yield was increased by potassium nitrate spray.

6- Fruit physical properties:-

Fruit weight was highest with the application of ammonium sulphate at 15% in both seasons (Table 4). It was significantly followed by fruits of potassium nitrate treatment at 6%. The minimum fruit weight was observed when tree received to ammonium sulphate at 5%. This generalization was also good held for fruit diameter and fruit length.

7- Fruit chemical properties:-

The data from Table (5) showed that TSS and acidity under different treatments showed appreciable differences in both seasons (2003&2004).

4-

5

However, the trees treated with potassium nitrate at 6% or ammonium sulphate at 15% exhibited the significant lowest acidity concomitant with high TSS % as compared to the control. TSS/Acid ratio was affected significantly with tested treatment in both seasons (2003&2004). 15% ammonium sulphate exerted the significant highest ratio, followed by ammonium sulphate at 10% whereas, potassium nitrate at 2% came at last. Moreover, these treatments also showed the maximum content of ascorbic acid in first season (112.20 and 110.30 mg/100g, respectively) over the other treatments including control during winter season (Table 5). In the second one (2004) similar trend was obtained whereas, the maximum content of ascorbic acid was found with potassium nitrate at 4% and 6% and ammonium sulphate at 15% (111.40 and 110.00 mg/100g, respectively).

REFERENCES

Addicott, F. T. (1964): Induction Of Early Cropping Of Guava Seedling In Closely Planted Orchard Using Urea as a Defoliant Encyc. Plant Physiol., 15: 1094.

A.O.A.C. (1980): Association of Official Agriculture Chemists Official Method of Analysis 13th Ed. Washington, D.C.

Byers, R. E. and C. G. Lyons (1983): Effect of Some Chemical on Thinning And Fruiting Of Peach. J. Hort. Sci., 58 (4): 517.

Calderbank, A. (1972): Proceeding of The Second International IUPAC Congress of Pesticide Chemistry (ed.A.S.Tahori) 5, Gordon and Breach, New York, PP. 29-40.

Gorakh, S.; A. K. Singh and V. A. Jay (2000): Economic Evaluation of Crop Regulation Treatment in Guava (Psidium guajava L.). Indian J. Agric. Sci., 70 (4): 226-230.

Horwitz, W. (1970): Official Methods of Analysis. Association of Official Analytical Chemists 11th Ed. Washington, D.C.

Pena, J. E.; J. L. Sharp and M. Wysoki (2002): Tropical Fruit Pests and Pollinators: biology, economic importance, natural enemies and control. Wallingford. UK. CABI. Publishing Vii + 430 PP. ISBN 0.85199-434-2. (Hort. Abst., 72: 10531)

Poapst, P. A. and M. G. Anderson (1983): Chemical Thinning of Peach. J. Hort. Sci., 58 (1): 97.

Reddy, Y. N. (1987): Annual report of Indian Institute of Horticulture Research (IIHR) Bangalore for 1987-88, PP. 24-25.

Samson, J. A. (1986): Tropical Fruits. Znded. Trop. Agr. Ser., Longman Scientific Technical, New York

Shigeura, G. T.; R. M. Bullock and J. A. Silva (1975): Defoliation And Fruit Set in Guava. Hort. Sci., 10:590.

Singh, G. ; S. Rajan; D. Pandey and A. K. Singh (1991): Annual Report of Central Institute for Subtropical Horticulture, Lucknow, PP.13-18.

Singh, R.; S. N. Singh; M. R. Gupta; G. S. Dhaliwal and S. K. Kalra (1992): Studies On Winter Cropping in Guava cv. Allahabed Safeda. Indian J. Hort., 49: 127-133.

Snedecor, G. W. and W. G. Cochran (1980): Statistical Methods 7th Ed. Iowa Univ Press Ames. Iowa U.S.A. PP 507.
Thoute, G. T. and V. R. Chakrawar (1982): Physico- Chemicals Characters of The Certain Types/Strains of Guava (Psidium guajava L.) Progressive. Hort. 14:269-272.
Van, O.J. (1966): Hormones And Regulators. Science 157: 721-731.

تأثير الرش ببعض المواد الكيماوية لدفع الإثمار الشتوي فى الجوافة

جمال محمد محمود حسيب
قسم الفاكهة- كلية الزراعة- جامعة القاهرة- مصر

أجريت هذه الدراسة خلال موسمى متتاليين هما ٢٠٠٣ ،٢٠٠٤ على أشجار جوافة بذرية تم إكثارها بالسرطانات من سلالة منتخب االقناطر ومنزرعة بأرض طينية بمنطقة قليوب-محافظة القليوبية لإنتاج أقصى إنتاج للجوافة فى الموسم الشتوى أذ تم رش الأشجار بنترات البوتاسيوم بتركيز ٢، ٤، ٦ % أو بسلفات الأمونيوم بتركيز ٥، ١٠، ١٥% عند تمام التزهير.

وكانت أهم النتائج المتحصل عليها كالأتى:-

- أعلى نسبة تساقط للأزهار فى الموسم الصيفى سجلت مع المعاملة بنترات البوتاسيوم بتركيز ٦% يليها الرش بسلفات الأمونيوم بتركيز ١٥%.
- سجلت المعاملة بنترات البوتاسيوم بتركيز٦% أقل نسبة من الثمار المتبقية يليها المعاملة بسلفات الأمونيوم بتركيز١٥% بينما سجل الكنترول أعلى نسبة من الثمار المتبقية (الموسم الصيفى).
- المعاملة بنترات البوتاسيوم بتركيز٦% سجلت أعلى محصول للجوافة الشتوية (الموسم الشتوى) يليها المعاملة بسلفات الأمونيوم بتركيز٥%
- تميزت الثمار الشتوية للأشجار المعاملة بنترات البوتاسيوم بتركيز ٦% والمعاملة بسلفات الأمونيوم بتركيز١٥% بزيادة وزن وقطر الثمار وكذلك ارتفاع نسبة المواد الصلبة الذائبة وانخفاض الحموضة.

Table (4): Effect of potassium nitrate and ammonium sulphate on fruit physical properties of guava trees.

Treatment	Fruit weight (g)			Fruit diameter (cm)			Fruit length (cm)		
	2003	2004	Mean	2003	2004	Mean	2003	2004	Mean
Potassium nitrate									
2%	115.7 D	105.5 DE	110.60	4.6 CD	4.5 A	4.55	5.1 A	5.2 AB	5.20
4%	121.3 C	110.0 CD	115.65	4.8 BC	4.9 A	4.85	5.2 A	5.1 BC	5.10
6%	130.7 B	123.3 B	127.00	5.0 AB	4.9 A	4.95	5.1 A	5.2 AB	5.20
Ammonium sulphate									
5%	100.7 F	101.5 E	101.10	4.5 D	4.6 A	4.55	4.9 A	4.8 C	4.80
10%	111.3 E	109.0 CD	110.15	4.6 CD	4.5 A	4.55	5.1 A	5.2 AB	5.20
15%	151.3 A	145.0 A	148.15	5.2 A	5.3 A	5.25	5.3 A	5.5 A	5.50
Control	110.3 E	112.0 C	111.15	4.6 CD	4.9 A	4.75	5.1 A	5.0 BC	5

Values followed by the same letter(s) within each season are not significantly different at 5 % level.

Table (5): Effect of potassium nitrate and ammonium sulphate on fruit chemical properties of guava trees.

Treatment	TSS (°Brix)			Acidity (%)			TSS/Acid ratio			Ascorbic acid (mg/100g)		
	2003	2004	Mean	2003	2004	Mean	2003	2004	Mean	2003	2004	Mean
Potassium nitrate												
2%	10.00 D	10.70 D	10.35	0.46 A	0.47 A	0.47	21.84 D	22.78 D	22.31	94.30 A	105.00 B	99.65
4%	10.20 C	10.50 E	10.35	0.41 B	0.42 AB	0.42	24.88 C	25.01 CD	24.95	110.00 A	111.40 A	110.70
6%	11.00 B	11.27 BC	11.14	0.39 C	0.40 B	0.40	28.20 B	28.55 B	28.38	112.20 A	114.00 A	113.10
Ammonium sulphate												
5%	11.00 B	11.50 A	11.25	0.44 A	0.42 AB	0.43	25.61 C	27.45 BC	26.53	96.90 A	101.20 BC	99.05
10%	11.20 A	11.10 C	11.15	0.37 C	0.39 B	0.38	29.48 B	28.49 B	28.99	97.10 A	103.00 BC	100.05
15%	11.00 B	11.40 AB	11.20	0.29 D	0.30 C	0.30	37.95 A	38.32 A	38.14	110.30 A	110.00 A	110.15
Control	10.30 C	10.50 E	10.40	0.38 C	0.40 B	0.39	25.79 C	25.97 BC	25.88	98.10 A	100.50 C	99.30

Values followed by the same letter(s) within each season are not significantly different at 5 % level.