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### Response of Ewaise Mango Trees to Foliar Spray with Egyptian Clover and Fenugreek Seed Sprout Extract under Aswan Conditions

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#### ABSTRACT

During 2019 and 2020 seasons Ewaise mango trees were subjected three times to foliar application of Egyptian clover and fenugreek seed sprout extract at 0.25 to 1.0%. The study focused on the impact of these treatments on growth, nutritional status of the trees, yield as well as physical and chemical characteristics of the fruits. Spraying Egyptian clover and fenugreek seed sprout extract at 0.25 to 1.0% was effective in enhancing growth traits, tree nutritional status, yield and fruit quality rather than non-application ones. The promotion was associated with increasing concentrations of extract used. Using fenugreek seed sprout extract was superior than using Egyptian clover seed sprout extract in this respect. No significant differences were seen due to increase in the concentration of used extracts. From the economic point of view, use the extracts of 0.5% are preferable. The best results concerning to growth, tree nutritional status, yield and fruit quality of Ewaise mango trees grown under Aswan region conditions were obtained due to use Egyptian clover or fenugreek seed sprout extracts at 0.5% three times.

**Keywords:** mango, yield, fruit quality, egyptian clover, fenugreek, seed sprout, pollution.



#### INTRODUCTION

Mango (*Mangifera indica* L.) is considered the queen fruit among all other fruit crops. It is one of the most important fruits of the tropical and subtropical countries of the world. It grows under a wide range of climatic and soil conditions. In Egypt, mango ranks the second after citrus, whereas its total area of fruitful orchards reached approximately 265509 fed. producing about 1091535 tons annually. In Aswan Governorate, where this study took place, fruiting area reached 13573 fed. produced about 67076 ton (M.A.L.R. 2019). The decline in yield of mango trees grown under Aswan region conditions is considered serious and major problems facing mango growers in this region. Meanwhile, various trials were done to raise the productivity and fruit quality of much fruit species by the wasteful use of chemical fertilizers, especially mineral ones. For avoiding the excessive use of mineral chemical fertilizers and their harmful effect particularly on human health consequently using of some natural bio stimulants such as plant extracts that characterized by their richer contents with nutrient elements, growth regulators, antioxidants and vitamins were investigated for being applied as an effective nutritive application that could be replace partially or completely the aforesaid harmful ones (Spinelli *et al.*, 2009; Ahmed *et al.*, 2013 and Anwar *et al.*, 2013).

Selecting the best source of nutrients as using extracts of crop seed sprout is considered the best horticultural practices used nowadays for promoting yield and fruit quality of mangoes and at the same times reducing environmental pollution.

Many attempts were accomplished to improve yield and fruit quality of fruit crops to facilitate fruit marketing and

exportation to foreign markets by using natural extract. Using crops seeds germination and sprouting extracts of different crop seeds may change the content and composition of fruits namely proteins, fats and amino acids and enhances the building and biosynthesis of essential amino acids such as glutamic acid, tryptophan, arginine, methionine and lysine, vitamin B & C and some macro and micro-nutrients and makes them high available to the tree (Cazuola *et al.*, 2004; Cairney, 2005; Biommeron, 2007; Anwar *et al.*, 2013 and Dhekney, 2016).

Treating fruit crops with crop seed sprout extracts had an obvious promotion on growth, yield and fruit quality (Ebeid-Sanaa, 2007; Ibrahiem *et al.*, 2007; El-Sayed-Esraa, 2010; Refaai, 2014; El-Khawaga and Mansour, 2014; Ahmed, 2015; Abdel-Rahman, 2015; El-Sharony *et al.*, 2015; Oraby, 2018 and Ali *et al.*, 2018).

The target of this study was to examine the effects of using Egyptian clover and fenugreek seed sprout extracts on growth and fruiting of Ewaise mango trees grown under Upper Egypt conditions.

#### MATERIALS AND METHODS

This investigation was carried out during 2019 and 2020 seasons on Ewaise mango cv. trees onto seeding rootstocks, grown in silty clay soil in a private orchard situated at Izbah Al Bayyarah, Kom Ombo district, Aswan governorate Egypt. The selected trees were 18- years old, healthy, nearly uniform in vigour, planted at 7x7 meters apart and received the same cultural practices. Surface irrigation system was used. Soil analysis was done according to the procedures outlined by Wilde *et al.* (1985) and the data are shown in Table 1.

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**Table 1. Analysis of the tested soil and chemical composition of fenugreek sprout.**

Constituents of soil	Values	Constituents of fenugreek sprout	Values (mg/100g F.W.)
Particle size distribution		Aspartic acid	2.2
Sand %	10.60	Arginine	2.1
Silt %	32.80	Alanine	2.9
Clay %	56.60	Isoleucine	2.1
Texture grade	Silty clay	Cysteine	1.9
pH ( 1: 2.5 extract)	7.88	Cystine	1.8
E.C. (1:2.5 extract)	0.91	Glutamic acid	2.0
Organic matter %	2.15	Methionine	6.0
CaCO <sub>3</sub> %	1.88	Lysine	5.1
Total N %	0.12	Vitamin A	1.0
P (Olsen, ppm)	22.00	Vitamin B <sub>1</sub>	0.32
K (ammonium acetate, ppm)	420.00	Vitamin B <sub>2</sub>	0.30
Mg (ppm)	79.00	Vitamin B <sub>6</sub>	1.0
S (ppm)	6.95	Vitamin C	2.0
EDTA extractable		Ca	220
Zn (ppm)	1.36	P	341
Fe (ppm)	11.11	K	469
Mn (ppm)	10.25	Mg	371
Cu (ppm)	1.63	Fe	242
		Phytic acid	0.9
		Niacin	1.4

Egyptian clover sprout is rich in vitamins A, B3, K and C. also, contains a high percentage of protein and a large number of amino acids as well as rich in minerals, such as iron, calcium, potassium, copper, magnesium, zinc, phosphorus, manganese, carotenoids, and isoflavones (Budryn *et al.* 2018 and Evans, 2020 )

**This study included the following seven treatments:**

- 1- Control (spraying water only).
- 2- Spraying Egyptian clover seed sprout extract at 0.25%
- 3- Spraying Egyptian clover seed sprout extract at 0.50 %.
- 4- Spraying Egyptian clover seed sprout extract at 1.0%.
- 5- Spraying fenugreek seed sprout extract at 0.25%.
- 6- Spraying fenugreek seed sprout extract at 0.50%.
- 7- Spraying fenugreek seed sprout extract at 1.0%.

Each treatment was replicated three times, one tree each. Egyptian clover and Fenugreek seed sprout extracts are prepared by sowing the seeds in dark place, then sprouts were harvested after 3-4 days from seed sowing. Sprouts were homogenate with distilled water at 1: 10 using an electric blender for five minutes, then filtrated and kept under 4°C in refrigerator till use.

Egyptian clover and fenugreek seed sprout extracts were sprayed three times at growth start (first week of March), just fruit set (3<sup>rd</sup> week of April) and one month later (3<sup>rd</sup> week of May). Analysis of this extract was carried out using the procedures methods that outlined by A.O.A.C. (2000) and data are shown in Table (1). Triton B as a wetting agent was added to all spraying solutions at 0.05%, and spraying was done until runoff. The experiment was arranged at Randomized complete block design (RCBD) with three replicates, one tree each.

The following parameters were measured during both seasons, length and thickness of shoot (cm), leaf number/shoot, leaf area (cm<sup>2</sup>) (Ahmed and Morsy, 1999), total chlorophylls and total carotenoids as mg/100 g F.W. (Hiscox and Isralstam, 1979); percentages of micro and macro elements (Wilde *et al.*, 1985), fruit retention %, number fruit/tree, yield/tree (kg), fruit weight (g), pulp percentages; T.S.S. %, total acidity %, total sugars content %, vitamin C content mg/100 ml juice and total fibers (A.O.A.C., 2000).

Statistical analysis was done using new L.S.D. test at 5% to differentiate among the seven treatment means (Gomez & Gomez, 1984 and Mead *et al.*, 1993).

## RESULTS AND DISCUSSION

### Results

#### 1- Vegetative growth and leaf chemical composition

Data presented in Tables 2 to 4 declared the effect of some plant seed sprout extracts as a foliar application on growth and leaf chemical composition of Ewaise mango trees during 2019 and 2020 seasons. It is obvious from the data that the results took a similar trend during the two studied seasons. It is clear from such data that spraying with Egyptian clover or fenugreek seed sprout extract at 0.25 to 1.0% significantly enhanced growth parameters i.e., length and thickness of the shoot, number of leaves/shoot and leaf area as well as significantly increased leaf total chlorophyll, carotenoid and nutrient contents compared to untreated ones (control). The improvement was significantly associated with increasing extract used concentrations from 0.25 to 1.0%. Using fenugreek seed sprout extract at any concentration was favorable than using Egyptian clover seed sprout extract.

The maximum values of these studied traits were recorded on the trees that supplied with fenugreek seed sprout extract at 0.1%. The control trees produced the lowest values.

The highest leaf area (88.0 cm<sup>2</sup>), total chlorophylls (11.30 mg/100 g FW), N (2.03%), K (1.37%), Zn (68.3 ppm) and Fe (71.96 ppm) as an av. of the two studied seasons, due to spray fenugreek seed sprout extract at 1.0%, respectively. The corresponding least values were (78.0 cm, 5.58 mg/100 g, 1.62%, 1.06%, 59.5 ppm and 60.06 ppm) on control trees, respectively. Hence the increment percentage attained for leaf area (12.82), total chlorophyll (102.5), N (25.31), K (29.25), Zn (9.58) and Fe (12.19%) as an av. of the two studied seasons due to spray with fenugreek sprout extract at 1.0% relative to the control. No significant differences were seen due to increase the concentration of Egyptian clover or fenugreek sprout extract from 0.5 to 1.0%. From economical point view, it is concluded that to



clover or fenugreek seed sprout extract at 0.25 to 1.0% significantly improved the fruit quality in terms of increasing fruit weight, pulp %, TSS, sugar contents and vitamin C content and decreasing total acidity and total fibers compared to check treatments. The improving was significantly associated with increasing concentration of seed sprout extract used. Increasing concentration from 0.5 to 1.0% failed to show significantly improved on quality traits. Therefore the recommended concentration from economical point view was 0.5%. Then, the best results with regard to fruit quality were obtained with spraying Egyptian clover or fenugreek seed sprout extract at 0.5%.

Under such promised treatment fruit weight (208.1 & 211.2 g), pulp % (74.33 & 75.58%), TSS (16.81 & 17.06%), total sugar (10.58 & 10.71%), V.C content (49.0

& 49.9 mg/100 ml juice) and total acidity (0.272 & 0.249%) compared produced values from control trees (186.6 g, 64.04%, 15.33%, 9.50%, 41.0 mg/100 ml juice and 0.352%). Then, the increment percentage of these values attained (7.77 & 13.18), (16.07 & 18.02), (9.65 & 11.29), (11.37 & 12.74), (19.51 & 21.71 as an av. the two studied seasons). On other hand, the decrement percentage of total acidity due to 0.5% of Egyptian clover or fenugreek seed sprout compared control treatment was attained (22.72 & 29.26% as an av. the two studied seasons), respectively. Hence, the cost wise evaluation of the using Egyptian clover or fenugreek seed sprout extract three times at 0.5% is very important to production of mango fruits, since improving the fruit quality induce an increase in the packable yield.

**Table 6. Effect of spraying Egyptian clover and fenugreek on some fruit quality of Ewaise mango trees during 2019 and 2020 seasons.**

Treat.	Fruit pulp%			TSS %			Total sugar %			Reducing sugar %		
	2019	2020	Mean	2019	2020	Mean	2019	2020	Mean	2019	2020	Mean
Control (water)	64.45C	63.63C	64.04	15.12D	15.53D	15.33	9.35C	9.65C	9.50	2.72C	2.78C	2.75
Egyptian clover 0.25%	70.18B	70.59B	70.39	16.27C	16.51C	16.39	10.04B	10.38B	10.21	2.92B	2.98B	2.95
Egyptian clover 0.50%	74.11AB	74.55A	74.33	16.69B	16.92B	16.81	10.41A	10.75A	10.58	3.03AB	3.10A	3.07
Egyptian clover 1.0%	74.80A	75.18A	74.99	16.80B	17.01AB	16.91	10.41A	10.80A	10.61	3.01AB	3.10A	3.06
Fenugreek 0.25%	71.38B	71.22B	71.30	16.52BC	16.69BC	16.61	10.10B	10.42B	10.26	2.93B	2.97B	2.95
Fenugreek 0.50%	75.30A	75.85A	75.58	16.96AB	17.15AB	17.06	10.51A	10.90A	10.71	3.05A	3.12A	3.09
Fenugreek 1.0%	75.93A	75.28A	75.61	17.10AB	17.32A	17.21	10.55A	10.90A	10.73	3.03AB	3.14A	3.09
New LSD 5%	3.38	3.20		0.35	0.36		0.29	0.31		0.11	0.12	

**Table 7. Effect of spraying Egyptian clover and fenugreek on some fruit quality of Ewaise mango trees during 2019 and 2020 seasons.**

Treat.	Non-reducing sugar %			Total acidity %			V.C. mg/100 ml juice			Total fiber		
	2019	2020	Mean	2019	2020	Mean	2019	2020	Mean	2019	2020	Mean
Control (water)	6.63C	6.87C	6.75	0.345A	0.358A	0.352	41.2D	40.8D	41.0	1.11A	1.16A	1.14
Egyptian clover 0.25%	7.12B	7.40B	7.26	0.291B	0.283B	0.287	45.8C	47.6C	46.7	0.98B	0.98B	0.98
Egyptian clover 0.50%	7.38A	7.65A	7.51	0.275C	0.268C	0.272	48.1B	49.9B	49.0	0.91BC	0.86C	0.89
Egyptian clover 1.0%	7.40A	7.70A	7.55	0.267C	0.257C	0.262	48.8AB	50.8AB	49.8	0.90C	0.85C	0.88
Fenugreek 0.25%	7.17B	7.45B	7.31	0.273C	0.265C	0.269	46.7BC	48.8BC	47.8	0.94B	0.88C	0.91
Fenugreek 0.50%	7.46A	7.78A	7.62	0.252D	0.246C	0.249	48.9AB	50.9AB	49.9	0.86C	0.83C	0.85
Fenugreek 1.0%	7.52A	7.76A	7.64	0.246D	0.248C	0.247	50.1A	51.6A	50.9	0.86C	0.82C	0.84
New LSD 5%	0.18	0.18		0.011	0.10		1.37	1.41		0.07	0.07	

**Discussion**

Germination or sprouting seeds in various crops may change all complex substances such as proteins, carbohydrates and fats to simple ones and stimulate the occurrence of soluble sugars, amino acids, natural hormones and antioxidants. The higher content of sprouts from amino acids such as cysteine, cysteine, methionine, tryptophan, glutamic acid, arginine, aspartic acid, thiamin, alanine, leucine and isoleucine, vitamins A, B & B2 & B6, C and E and nutrients such as N, P, K, Mg, Ca, Fe, Mn and Cu is accompanied with protecting the trees from aging and unfavorable conditions and enhancing cell division and biosynthesis of carbohydrates and plant pigments (Cazuola et al., 2004 and Biomerson, 2007).

Our results showed that spraying Egyptian clover and fenugreek seed sprout at 0.5% three time improved the growth aspects, yield and fruit quality, which increased the leaf area about 11.8%, total chlorophyll 80%, N 20%, K 26% as well as yield 32% fruit weight 10.5%, total sugars 12% and vitamin C about 20%.

The results with regard to the promoting effect of fenugreek and Egyptian clover seed sprout on growth and fruiting of Ewaise mango trees are in harmony with these

obtained by Ebeid-Sanaa, 2007; Ibrahim et al., 2007; El-Sayed-Esraa, 2010; Refaai, 2014; El-Khawaga and Mansour, 2014; Ahmed, 2015; El-Sharony et al., 2015; Oraby, 2018 and Ali et al., 2018.

**CONCLUSION**

Treating Ewaise mango trees grown under Upper Egypt conditions with fenugreek and Egyptian clover sprout extract at 0.5% gave the best results with regard to vegetative growth and nutritional status of trees as well as yield and fruit quality.

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### استجابة أشجار الماتجو العويس للرش بمستخلص نبت بذور البرسيم المصري والحلبة تحت ظروف أسوان عبد الفتاح الصالحي<sup>1</sup>، حسين حمدان سعيد<sup>2</sup>، أحمد يس أحمد<sup>3</sup> و إبراهيم عبد الفتاح حسن<sup>2</sup> <sup>1</sup> قسم الفاكهة – كلية الزراعة – جامعة أسيوط <sup>2</sup> قسم البساتين – كلية الزراعة والموارد الطبيعية – جامعة أسوان <sup>3</sup> مركز البحوث الزراعية بمعهد البحوث البستانية بالجيزة

أجريت هذه الدراسة خلال موسمين تجريبيين متتاليين 2019 و 2020 علي أشجار ممتلئة من الماتجو العويس والبالغه 18 عاماً والمطعمه علي أصل بذري وتقع هذه الأشجار في مزرعة خاصة بكم أمبو ، محافظة أسوان، مصر. الأشجار المزروعة علي مسافة 7×7 أمتار، التربة طينية طميية القوام لا يقل ارتفاع مستوى الماء الأرضي عن مترين، وكان نظام الري المتبع هو الري السطحي. وكان الهدف من هذه الدراسة اختبار تأثير الرش الورقي لنبت بذور البرسيم المصري والحلبة علي النمو الخضري والإثمار في أشجار الماتجو العويس. وقد استخدم نبت بذور البرسيم المصري والحلبة بتركيز من 0,25 – 1% ثلاث مرات، وتم تكرار كل معاملة ثلاثة مرات بمعدل شجرة لكل مكررة. وقد أوضحت النتائج التالي:- سبب الرش بمستخلص نبت بذور البرسيم المصري والحلبة زيادة مؤكدة في خصائص النمو الخضري والحالة الغذائية للأشجار من حيث مساحة الأوراق ومحتواها من الكلوروفيل وكذلك العناصر الغذائية مقارنة بالرش بالماء (معاملة المقارنة). أدت جميع المعاملات إلي زيادة مؤكدة في المحصول وتحسين خصائص الثمار من حيث زيادة وزن الثمرة وكذلك محتواها من المواد الصلبة الذاتية والسكريات وفيتامين (C) مقارنة بالرش بالماء.- لم تسجل فروق معنوية لكل من سمات النمو الخضري والحالة الغذائية والمحصول وخصائص الثمار بزيادة تركيز محلول الرش من 0,5 إلي 1%، ولذا من الناحية الاقتصادية يفضل استخدام الرش بتركيز 0,5%. من نتائج هذه الدراسة يمكن التوصية بأهمية الرش بمستخلص نبت أي من بذور البرسيم المصري والحلبة بتركيز 0,5% ثلاث مرات خلال موسم النمو (بداية النمو – بعد العقد مباشرة – مرة ثالثة بعد شهر) – حيث تؤدي هذه المعاملة إلي تحسين النمو الخضري والحالة الغذائية لأشجار الماتجو العويس مع إنتاج محصول عال ذو خصائص ثمرية جيدة فضلاً عن تقليل التلوث الناشئ عن استخدام المواد الكيميائية في البساتين حيث أنها مستخلصات طبيعية.