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# Effect of Filter Cake and Some Biocompounds on Growth and Yield of Manfalouty Pomegranate Trees Grown in Sandy Soil

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## ABSTRACT

This study was undertaken during 2013 & 2014 seasons on 12-year-old Manfalouty pomegranate trees (*Punica granatum* L.) grown in a private orchard situated at Arab-Elawamer region, Abnoub city, Assiut Governorate, Egypt under drip irrigation system and spaced 4 x 4 meters apart. The aim of this investigation was to examine the effect of using filter cake enriched with yeast and/or EM, as a partial alternative to mineral N fertilizers on growth and flowering aspects, tree nutritional status, yield, fruit splitting % and fruit quality of Manfalouty pomegranate trees grown in sandy soil. The obtained results indicated that, fertilizing trees with filter cake at 50 and 100% of N either alone or with EM and/ or yeast each at 0.2% was considerably effective in stimulating all growth aspects, leaf contents of pigments, N, P, K, Mg, Ca, Zn, Fe, Mn and Cu, number of flowers / tree, number of perfect flowers/tree, marketable yield (kg) and both physical and chemical characteristics of the fruits relative to the control. However, number of male flowers/tree, number of splitted fruits/ tree, fruit peel weight and thickness, total acidity % and total soluble tannins were remarkably reduced by using filter cake with/or without yeast and EM application. Hence, for promoting the remarkable yield and fruit quality which leading to get higher profit of Manfalouty pomegranate trees grown under sandy soil along with controlling fruit splitting, it is advised to use filter cake at 100% of the recommended N (300 g/tree /year) enriched with 0.2 % yeast and EM1 (2 kg from yeast and 2 L/EM/ton filter cake), four times starting from the first week of January at two months interval.

**Keywords:** Filter cake, yeast, EM, Manfalouty pomegranate, yield, fruit splitting, fruit quality

## INTRODUCTION

Splitting and sunburn pomegranate fruits are considered serious problems facing growers under Egyptian conditions. These damaged fruits have less keeping quality, unfit for shipment and marketing and liable to rot. The main causes of these drawbacks are genetically factors, malnutrition, higher temperature and unfavorable climatic conditions (Sheets *et al.* 2014).

Filter cake (also known as filter mud or filter press) with properties of 6.85 pH; 1.68% N; 1.13% P; 0.31 % K; 1.1 % Ca; 0.40 % Mg and 3.2 % Si (Dee *et al.* 2002) is a waste produced during clarification of cane juice following milling. Lime is added to the heated juice and the suspended organic matter is then filtered in filter presses and collected as a solid cake. The filter cake contains substantial amounts of $CaCO_3$ and different nutrients.

At the time being, the use of bio- fertilizers, for fruit crops is one of the corrective techniques that should be followed for avoiding the diverse hazards induced by application of chemical fertilizers, synthetic phytohormones and pesticides. Bio-fertilizers are the most important factor for plant production and soil fertility as they improve the biological, physical and chemical properties of the soil. Biological fertilization plays an important role in stimulating sustainable agriculture (Kannaiyan, 2002).

Clean cultivation is greatly achieved by using EM and yeast (*Saccharomyces cerevisiae*). Yeast contains IAA and cytokinins, which effectively promote growth in plants and delay leaf aging. In addition, it contains 93 % dry matter, 44.4 % protein, 2.19 % arginine, 2.09 % glycine, 1.07 % histidine, 2.14 % isolysine, 3.19 % leucine, 3.23 % lysine, 0.70 % methionine, 0.50 % cystine, 1.18 % phenylalanine, 1.49 % tyrosine, 2.06 % threonine, 0.19 % treptophan and 2.32 % vitamin B. Also, it contains 7.5 - 8.5 % N, 2-3 % fat, 8 - 9.5 % ash, 6 - 12 % nucleic acid and 45 - 51 % crude protein. Other constituents of yeast are glutathione, lecithin, enzymes and co-enzymes. Furthermore, yeast contains vitamin B (thiamin), $B_6$ (pyridoxine) and glycine (Abou-Zaid, 1984). Also, it is very essential for the synthesis of aminoleulinic acid (AA) and for the formation of protoporophrin, the precursor of chlorophyll. It aids in activating photosynthesis process through enhancing the release of carbon dioxide (NRP, 1977 and Barnett *et al.* 1990). Using effective microorganisms (EM) has beneficial effect in inoculating different cultures of microorganisms into soil, where they shift the microbiological equilibrium and create an environment that is favourable to the growth and health of plants. It is capable for enhancing N fixation, organic matter, nutrient and water uptake and root development, as well as for reducing soil pH that is responsible for increasing the availability of different nutrients (Higa, 1991 and Joo *et al.* 1999). Using EM and other bio-fertilizers besides organic fertilization resulted in an obvious promotion on growth, yield and fruit quality rather than non-application of them with these amendments.

Previous studies proved that, using yeast and EM were very effective in enhancing growth and flowering aspects, tree nutritional status, yield and fruit quality in different fruit crop species. {Ahmed (2001), Hosam El-Deen *et al.* (2001), Moustaffa and El-Hosseiny, (2001), Mostafa (2004), Badawi (2005), Mouftah (2007), Mohamed *et al.* (2008), and Abdalla (2014)} on yeast and {Abd-Rabou (2006), Mofeed (2009), Badran and Mohamed (2009), Ahmed (2011), Roshdy *et al.* (2011), Ibrahim (2012), Hassan (2014), Abdel–Aziz (2015) and Abd -El- Reheem, (2015)} on EM.

The purpose of this study was to examine the effect of filter cake enriched with and / or $EM_1$, as a partial alternative to mineral N fertilizers on growth aspects, flowering criteria, yield, fruit splitting, sunburned fruits and fruit quality of Manfalouty pomegranate trees grown under Assuit governorate conditions.

## MATERIALS AND METHODS

This investigation was carried out during 2013 and 2014 seasons on twenty seven uniform in vigor, 12-year-old Manfalouty pomegranate trees (*Punica granatum* L.) grown in a private orchard situated at Assuit district, Assiut Governorate, Egypt. The trees are planted at 4 x 4 meters

apart. Drip irrigation system using well water was adopted. The texture of the tested soil is sandy. Analysis of the experimental soil was done according to the procedures outlined by Peach and Tracey (1968) and the data are shown in Table (1).

**Table 1. Analysis of the tested soil at the trial location.**

| Constituent | Values |
|---|---|
| Sand (%) | 83.07 |
| Silt (%) | 10.22 |
| Clay (%) | 6.71 |
| Texture | Sandy |
| pH ( 1: 2.5 extract) | 7.69 |
| EC ( 1 :2.5 extract) (mmhos/cm/25°C) | 1.69 |
| OM (%) | 0.09 |
| $CaCO_3$ (%) | 3.11 |
| Total N (%) | 0.009 |
| Available P (Olsen method , ppm) | 1.1 |
| Available K ( ammonium acetate , ppm) | 46.5 |

The selected trees (27 trees) received regular horticultural management as recommended.

**1- Experimental work:**

**This experiment included the following nine treatments:**

1- 100 % mineral N (300 g N/ tree/ year) via (896.09 g ammonium nitrate / tree).
2- 100% filter cake (1.68 % N) via (17.86 kg/ tree).
3- 50 % mineral N (448 g ammonium nitrate / tree) + 50% filter cake (8.93 kg/ tree).
4- 100% filter cake (17.86 kg/ tree) + 0.2% EM (2.0 L/ ton).
5- 100 % filter cake + 0.2 % yeast (2.0 kg/ ton).
6- 100 % filter cake + 0.2 % EM + 0.2 % yeast.
7- 50% filter cake (8.93 kg/ tree) + 0.2 % EM (2.00 L. /ton)
8- 50% filter cake + 0.2% yeast (2.0 kg/ ton).
9- 50% filter cake + 0.2 % EM + 0.2 % yeast.

Each treatment was replicated three times, one tree per each. Filter cake (1.68 % N) was added once just after winter pruning (the 3rd week of Jan.). Ammonium nitrate (33.5 % N) was added biweekly via fertigation system. Yeast was activated before application with the assistance of Egyptian treacle and warm water (4°C) for 30 minutes (Table 2). Fresh EM (effective microorganisms) one ml contains 0.6 x $10^8$ microbial strains) and yeast were added at 0.2% each (2.0 kg of yeast and 2 L of EM for one ton of filter cake). A mixture of filter cake (Table, 3) with yeast or EM or with both was prepared by adding two kilograms of activated yeast or two liters of EM to one ton of filter cake and left the mixture for 45 days under higher levels of moisture for complete analysis. During fermentation and every 15 days the mixture was stirred and the stirring was repeated biweekly. The trees received four additions started on the first week of January and at two week intervals (1st week March, May and July).

The untreated trees were sprayed with water containing Triton B. This experiment was arranged in a complete randomized design (CRD) with nine treatments, each replicated three times, one tree per each (Snedecor and Cochran, 1980).

**2- Data recorded:**

**1. Measurements of vegetative growth characteristics:**

At growth cessation of each season (the last week of July), number of new shoots/tree was counted. Sixteen new shoots were chosen on four labeled branches (four shoots towards each side) for measuring shoot length (cm) and thickness (cm) and number of leaves/shoot. Leaf area $(cm)^2$ was calculated in the twenty mature leaves located at the base of the labeled shoots using the following equation reported by Ahmed and Morsy (1995). Leaf area ($cm^2$) = 0.53 (length x width) + 1.06

**Table 2. Chemical analysis of the used yeast (According to NRP, 1977, Abou- Zaid, 1984 and Barnett *et al.* 1990).**

| Properties | Values |
|---|---|
| Amino acids (mg/1000 g dry weight) | - |
| Arginine | 1.99 |
| Histidine | 2.63 |
| Isoleucine | 2.31 |
| Leucine | 3.09 |
| Lycine | 2.95 |
| Methionine | 0.72 |
| Phenyl alanine | 2.01 |
| Threonine | 2.09 |
| Tryptophan | 0.45 |
| Valine | 2.19 |
| Glutanic acid | 2.00 |
| Serine | 1.59 |
| Asparatic acid | 1.33 |
| Cystine | 0.23 |
| Proline | 1.53 |
| Tyrosine | 1.49 |
| N % | 7.3 |
| Fat % | 3.5 |
| Ash % | 6.7 |
| Glucose % | 13.33 |
| Vitamins (mg/ 100g dry weight) | - |
| $B_1$ | 3.23 |
| $B_6$ | 1.25 |
| $B_2$ | 1.33 |
| $B_{12}$ | 0.15 |
| Thiamine | 2.71 |
| Riboflavin | 4.96 |
| Enositol | 0.26 |
| Biotin | 0.09 |
| Nicotinic acid | 39.88 |
| Pantothenic acid | 19.56 |
| Folic acid | 4.36 |

**Table 3. Mechanical and chemical analysis of the used filter cake.**

| Construction | Value |
|---|---|
| Density | 40 kg/m |
| Moisture | 31.9 % |
| pH | 7.42 |
| EC | 1.95 (m mhos/cm) |
| Total nitrogen | 1.80 % |
| Organic matter | 54.8 % |
| Organic Carbon | 31.8 % |
| Ash | 50 % |
| C/N ratio | 17.70 |
| P | 2.12 % |
| S | 1.20% |
| K | 3.20% |
| Ca | 3.30 % |
| Mg | 2.80 % |
| Fe (ppm) | 3688 |
| Mn (ppm) | 430 |
| Cu (ppm) | 60 |
| Zn (ppm) | 49 |

**2. Leaf pigments content:**

Chlorophyll a & b (mg/g FW) were determined in the fresh leaf samples previously taken for calculating the leaf area according to the method explained by Von-Wettstein (1957) and Hiscox and Israelstam (1979). Total

chlorophyll was calculated by summation of chlorophyll a and b (mg/g FW)

**3. Leaf N, P, K, Mg, Ca, Zn, Fe, Mn and Cu content:**

Fifty mature leaves, six-months age from non-fruiting shoots for each tree (according to Summer, 1985) were taken (at the 1st week of Sept.) for measuring of N, P, K, Mg and Ca (as %) (Peach and Tracey, 1968) as well as Zn, Fe, Mn, and Cu as (ppm) according to the procedures indicated by Cottenie *et al.* (1982).

**4. Flowering and fruit setting characters:**

During flowering (mid-March), number of flowers/tree, number of male and hermaphrodite (perfect) flowers/tree, sex ratio was calculated relative to total number of perfect flowers and number of flowers/shoot were determined every season.

**5. Yield and marketable fruits /tree:**

Harvesting was took place when red colour in most fruits reached about 75% (the 1st week of October during both seasons) according to Sheets *et al.* (2014). Total number of fruits/tree, splitted and sunburned fruits and number of marketable fruits/tree were counted. Gross yield/ tree and marketable yield (kg.)/tree were recorded.

**6 Fruit quality:**

**1. Physical properties:**

Five fruits from each tree were randomly selected and transported to the laboratory for determination of fruit weight (g) and dimensions (height and diameter in cm.), fruit peel weight (%) and thickness (cm.), juice %, fruit pomace % and edible to non – edible portions.

**2. Chemical properties:**

TSS %, total reducing and non reducing sugars % (Lane and Eynon, 1965), total soluble tannins %, total acidity % (as g citric acid / 100 ml juice) (AOAC, 1995) and total anthocyanins (mg/100 g FW) in the fruits peels and juice were recorded (Fulcki and Francis, 1968).

**7. Economic evaluation:**

**Economic evaluation was calculated according to Heady and Dillon (1961) as follows:**

- Cost of fertilizing with filter cake/Feddan = number of trees (262) × amount of filter cake /tree (20 kg) × price of filter cake (400 L. E/ ton) = 2160 I.E
- Total cost of filter cake /Feddan = number of trees × amount of filter cake /tree × price = 270 I.E
- Total cost of yeast /Feddan = = 54 I.E
- Total cost of EM /Feddan = = 27 I.E
- Total cost of half amount of filter cake /Fadden = = 135 I.E
- Fixed expenses = (mineral fertilization, labor, pesticides and others) = 2300 L.E
- Total cost = sum of all costs.
- Total gross income = average of marketable yield of two seasons (kg)/Feddan × total price (3.5 L.E)
- Gross margin = total gross income - total cost

**3- Statistical analysis:-**

The experimental data were tabulated and statistically analyzed according to the method described by Snedecor and Cochran (1980) and the differences between mean various treatments were compared by using Duncan Multiple Range Test at 5% level of probability (Duncan, 1955).

## RESULTS AND DISCUSSION

**1- Vegetative growth characteristics:**

Data in Table 4 clearly show that, supplying the trees with N (300 g N/ tree/year) via 50 to 100% filter cake either alone or with yeast and/or EM each at 0.2% improved the five growth traits; namely number of new shoots/ tree, length and thickness of shoot (cm), number of leaves/shoot and leaf area ($cm^2$) relative to using 100% mineral N. Using filter cake at 50 to 100% of N in combined with yeast and/or $EM_1$ significantly enhanced these aspects. Using filter cake with yeast or EM preferable than using filter cake alone at 100%. Using filter mud at 100% of N with each EM and yeast was significantly superior than using filter cake at 50% with ether of them. Using yeast and EM with filter cake was better than using each alone. Using 50% mineral N + 50 % filter cake was significantly effective than using all N management treatments except for the application of 100% filter cake + yeast + EM each at 0.2%. The maximum values of growth characteristics were recorded on the trees received four additions of filter cake at 100% of N + yeast + EM each at 0.2% (2 kg/ton yeast or 2 l/ton EM). The treatments included 50% mineral N + 50% filter cake occupied the second position in this respect. The lowest values were recorded on the trees that received N as 100% inorganic N. These results were true during both seasons.

**2- Leaf chemical compounds:**

It is clear from the data in Tables 5 & 6 that, fertilizing Manfalouty pomegranate trees with N through 50 to 100% filter cake either alone or with 50% mineral N, yeast and EM each at 0.2% significantly enhanced chlorophyll a & b, total chlorophylls, total carotenoids, N, P, K, Mg, Ca, Zu, Fe, Mn and Cu in the leaves of treated trees relative to the application of N in the mineral form. Increasing percentages of filter cake from 50 to 100% caused a significant promotion on all leaf pigments and nutrients. Using any one of the two bio-compounds (yeast or EM) with filter cake was significantly more effective than using filter cake alone at 100% in enhancing these chemical components. Enriching filter cake with EM significantly gave better results than the application of yeast with filter mud in this respect. Combined application of yeast and $EM_1$ with filter cake recorded the utmost high means of these chemical constituents than the individual using of yeast or EM. Using 100% filter cake was significantly superior than using N as 100 % mineral N in this connection. Treating the trees with N as 100% filter cake + 0.2 % yeast + 0.2 % $EM_1$ gave the maximum values at all. The second rank in this respect was attained by the application of N as 50% filter cake + 50% mineral N. The lowest values were recorded on the trees that received N as 100% mineral N. Similar results were announced during both seasons.

**3- Flowering aspects:**

It is worth to mention from the data in Table 7 that, number of flowers/tree, number of male and perfect flowers/ tree and number of flowers/shoot were significantly increased in response to the application of N as filter cake (50-100 %) enriched or not with yeast and EM compared to the application of N completely in mineral form. The promotion of these flowering characters

was greatly accomplished by using yeast and/or EM with filter cake. Enriching filter cake with yeast and/or EM was more favourable than using filter cake alone or when yeast or $EM_1$ was applied alone. Using the filter cake at higher percentages, namely 100% especially with both the used bio-compounds gave the maximal values rather than using the lower percentages.

**Table 4. Effect of filter cake, EM and yeast application on some vegetative growth characteristics of Manfalouty pomegranate trees during 2013 and 2014 seasons.**

| Treatments | No. new shoots/ tree | Shoot length (cm) | Shoot thickness (cm) | No. of leaves/ shoot | Leaf area $(cm)^2$ |
|---|---|---|---|---|---|
| | | | First season: 2013 | | |
| 100 % mineral N (896.09 g ammonium nitrate / tree). | 17.00h | 36.00i | 0.33h | 17.00e | 6.11g |
| 100% filter cake (17.86 kg/ tree). | 18.00gh | 38.00h | 0.40g | 17.68e | 6.31g |
| 50 % mineral N (448 g ammonium nitrate / tree) + 50% filter cake (8.93 kg/ tree). | 31.00b | 51.50b | 0.87b | 22.44d | 8.00ab |
| 100% filter cake + 0.2% EM (2.0 L/ ton). | 28.00c | 48.00c | 0.81c | 21.08de | 7.67bc |
| 100 % filter cake + 0.2 % yeast (2.0 kg/ ton). | 25.00d | 46.00d | 0.71d | 20.40de | 7.33cd |
| 100 % filter cake + 0.2 % EM + 0.2 % yeast. | 33.00a | 54.00a | 0.93a | 70.00a | 8.31a |
| 50% filter cake + 0.2 % EM (2.00 L. /ton) | 21.00f | 41.90f | 0.54e | 56.00bc | 6.74ef |
| 50% filter cake + 0.2% yeast (2.0 kg/ ton). | 19.00g | 39.90g | 0.47f | 54.00c | 6.52fg |
| 50% filter cake + 0.2 % EM + 0.2 % yeast. | 23.00e | 44.00e | 0.59e | 58.30b | 7.00de |
| | | | Second season: 2014 | | |
| 100 % mineral N (896.09 g ammonium nitrate / tree). | 16.00h | 35.30i | 0.32h | 50.70h | 6.30f |
| 100% filter cake (17.86 kg/ tree). | 20.00g | 39.60h | 0.38g | 52.60gh | 6.18f |
| 50 % mineral N (448 g ammonium nitrate / tree) + 50% filter cake (8.93 kg/ tree). | 33.00b | 53.50b | 0.88a | 66.80b | 8.19ab |
| 100% filter cake + 0.2% EM (2.0 L/ ton). | 30.00c | 50.00c | 0.80b | 63.00c | 7.87bc |
| 100 % filter cake + 0.2 % yeast (2.0 kg/ ton). | 27.00d | 48.10d | 0.71c | 60.90cd | 7.54c |
| 100 % filter cake + 0.2 % EM + 0.2 % yeast. | 36.00a | 56.00a | 0.92a | 71.00a | 8.51a |
| 50% filter cake + 0.2 % EM (2.00 L. /ton) | 23.00f | 44.00f | 0.55e | 57.00ef | 6.95de |
| 50% filter cake + 0.2% yeast (2.0 kg/ ton). | 21.00g | 41.90g | 0.48f | 55.00fg | 6.72e |
| 50% filter cake + 0.2 % EM + 0.2 % yeast. | 25.00e | 45.90e | 0.63d | 59.20de | 7.19d |

**- Means within the same column having the same letters are not significantly different according to Duncan's Multiple Range Test (DMRT) at 5 % level of probability.**

**Table 5. Effect of filter cake, EM and yeast application on some leaf chemical components of Manfalouty pomegranate trees during 2013 and 2014 seasons.**

| Treatments | Chlorophyll a (mg/g FW) | Chlorophyll b (mg/g FW) | Total chlorophyll (mg/g FW) | Total carotenoids (mg/g FW) | N (%) | P (%) | K (%) |
|---|---|---|---|---|---|---|---|
| | | | First season: 2013 | | | | |
| 100 % mineral N | 1.90i | 0.90h | 2.80i | 1.20h | 1.57h | 0.10g | 1.11f |
| 100 % filter cake | 2.40h | 1.20g | 3.60h | 2.03g | 1.65gh | 0.22f | 0.16g |
| 50% mineral N + 50% filter cake | 5.50b | 3.40a | 8.90b | 5.80b | 2.14b | 0.81ab | 1.64a |
| 100 % filter cake + EM | 4.90c | 3.00b | 7.90c | 5.20c | 2.05bc | 0.76bc | 1.57ab |
| 100 % filter cake + Yeast | 4.30d | 2.60c | 6.90d | 4.60d | 1.97cd | 0.66c | 1.50b |
| 100 % filter cake + EM +Yeast | 6.23a | 3.20ab | 9.43a | 6.50a | 2.44a | 0.88a | 1.38cd |
| 50 % filter cake + EM | 3.40f | 2.00e | 5.40f | 3.70e | 1.81ef | 0.43e | 1.31d |
| 50 % filter cake + Yeast | 2.90g | 1.60f | 4.50g | 3.20f | 1.73fg | 0.33e | 1.22e |
| 50 % filter cake + EM + Yeast | 4.00e | 2.30d | 6.30e | 4.30d | 1.90de | 0.55d | 1.41c |
| | | | First season: 2014 | | | | |
| 100 % mineral N | 2.00i | 1.00i | 3.00i | 2.30g | 1.52g | 0.09g | 1.08i |
| 100 % filter cake | 2.50h | 1.30h | 3.80h | 2.80g | 1.67f | 0.21f | 1.20h |
| 50% mineral N + 50% filter cake | 5.60b | 3.50a | 9.10b | 5.90a | 2.16b | 0.80ab | 1.69b |
| 100 % filter cake + EM | 5.00c | 3.10c | 8.10c | 5.40b | 2.07bc | 0.75b | 1.61c |
| 100 % filter cake + Yeast | 4.40d | 2.70d | 7.10d | 4.70c | 1.99cd | 0.66c | 1.54d |
| 100 % filter cake + EM +Yeast | 6.30a | 3.30b | 9.60a | 5.60b | 2.49a | 0.87a | 1.76a |
| 50 % filter cake + EM | 3.50f | 2.10f | 5.60f | 3.80e | 1.83e | 0.44e | 1.35f |
| 50 % filter cake + Yeast | 3.00g | 1.70g | 4.70g | 3.30f | 1.67f | 0.36e | 1.26g |
| 50 % filter cake + EM + Yeast | 4.10e | 2.40e | 6.50e | 4.40d | 1.91de | 0.55d | 1.43e |

**- Means within the same column having the same letters are not significantly different according to Duncan's Multiple Range Test (DMRT) at 5 % level of probability.**

Using N as 100% filter cake alone was more superior than using N as 100% inorganic N in this regard. The maximum number of flowers/tree (341 and 348 flowers/tree) during both seasons, respectively were recorded on the trees received N as 100% filter cake + 0.2 % yeast + 0.2 % EM1 comparing with application of 100% mineral N (264 and 271). Sex ratio (male/perfect flowers) was significantly reduced with supplying the trees with N via 50 to 100% filter cake amended with yeast and/or EM, comparing with the application of N either as 100% filter cake or 100% mineral N. The lowest means of sex ratio were recorded on the trees that supplied with N as 100% filter cake + 0.2 % yeast + 0.2 % EM (0.78 and 0.78) to reach (3.00 and 2.82) in N as 100 % inorganic, in both seasons, respectively. The lowest values in all flowering traits except sex ratio were obtained by the trees fertilized with N as 100% mineral N. These results were true during the two seasons.

**Table 6. Effect of filter cake, EM and yeast application on some leaf chemical components of Manfalouty pomegranate trees during 2013 and 2014 seasons.**

| Treatments | Mg % | Ca % | Zn (ppm) | Fe (ppm) | Mn (ppm) | Cu (ppm) |
|---|---|---|---|---|---|---|
| | | | First season: 2013 | | | |
| 100 % mineral N | 0.42h | 1.99f | 50.10i | 46.30i | 52.90i | 1.11g |
| 100 % filter cake | 0.46gh | 2.11ef | 54.10h | 49.30h | 58.57h | 1.18fg |
| 50% mineral N + 50% filter cake | 0.81b | 2.84a | 84.10b | 71.00b | 85.90b | 1.66ab |
| 100 % filter cake + EM | 0.75bc | 2.71ab | 80.00c | 66.90c | 80.00c | 1.56bc |
| 100 % filter cake + Yeast | 0.69cd | 2.59bc | 75.30d | 63.00d | 75.60d | 1.48cd |
| 100 % filter cake + EM +Yeast | 0.90a | 2.63a-c | 89.10a | 74.90a | 90.57a | 1.75a |
| 50 % filter cake + EM | 0.59ef | 2.33de | 64.00f | 57.00f | 65.70f | 1.33d-f |
| 50 % filter cake + Yeast | 0.52fg | 2.22e | 59.00g | 53.50g | 61.70g | 1.26e-g |
| 50 % filter cake + EM + Yeast | 0.64de | 2.45cd | 70.00e | 60.00e | 70.90e | 1.40de |
| | | | Second season: 2014 | | | |
| 100 % mineral N | 0.39g | 1.59g | 49.90i | 45.90i | 53.00i | 1.13h |
| 100 % filter cake | 0.48f | 2.10f | 53.90h | 50.00h | 58.00h | 1.20gh |
| 50% mineral N + 50% filter cake | 0.83b | 2.85ab | 83.80b | 69.90b | 76.67b | 1.68ab |
| 100 % filter cake + EM | 0.76c | 2.70bc | 79.80c | 67.00c | 79.80c | 1.59bc |
| 100 % filter cake + Yeast | 0.70d | 2.58cd | 74.40d | 62.80d | 75.30d | 1.51cd |
| 100 % filter cake + EM +Yeast | 0.91a | 2.97a | 89.10a | 74.50a | 91.10a | 1.78a |
| 50 % filter cake + EM | 0.60e | 2.34e | 63.90f | 56.90f | 65.80f | 1.35ef |
| 50 % filter cake + Yeast | 0.53f | 2.28ef | 58.90g | 53.40g | 61.80g | 1.29fg |
| 50 % filter cake + EM + Yeast | 0.64e | 2.46de | 69.90e | 59.90e | 71.00e | 1.42de |

**- Means within the same column having the same letters are not significantly different according to Duncan's Multiple Range Test (DMRT) at 5 % level of probability.**

**Table 7. Effect of filter cake, EM and yeast application on some flowering aspects of Manfalouty pomegranate trees during 2013 and 2014 seasons.**

| Fertilization treatments | No. of flower/ shoot | No. Of flowers/tree | No. of male flowers/ tree | No. of perfect flower/tree | Sex ratio |
|---|---|---|---|---|---|
| | | First season: 2013 | | | |
| 100 % mineral N | 2.00g | 264.0i | 198.0a | 66.00i | 3.00a |
| 100 % filter cake | 3.00f | 271.0h | 194.0b | 77.00h | 2.52b |
| 50% mineral N + 50% filter cake | 7.00b | 329.0b | 155.0h | 174.0b | 0.89fg |
| 100 % filter cake + EM | 7.00b | 315.0c | 162.0g | 153.0c | 1.06fg |
| 100 % filter cake + Yeast | 7.00b | 305.0d | 166.0f | 139.0d | 1.19ef |
| 100 % filter cake + EM +Yeast | 8.00a | 341.0a | 149.0i | 192.0a | 0.78g |
| 50 % filter cake + EM | 5.00d | 287.0f | 183.0d | 104.0f | 1.76cd |
| 50 % filter cake + Yeast | 4.00e | 279.0g | 188.0c | 91.00g | 2.07c |
| 50 % filter cake + EM + Yeast | 6.00c | 295.0e | 174.0e | 121.0e | 1.44de |
| | | Second season: 2014 | | | |
| 100 % mineral N | 2.00f | 271.0h | 200.0a | 71.00i | 2.82a |
| 100 % filter cake | 3.00e | 278.0g | 196.0b | 82.00h | 2.39b |
| 50% mineral N + 50% filter cake | 7.00b | 336.0b | 157.0h | 179.0b | 0.88gh |
| 100 % filter cake + EM | 7.00b | 322.0c | 164.0g | 158.0c | 1.10fg |
| 100 % filter cake + Yeast | 7.00b | 312.0d | 168.0f | 144.0d | 1.13f |
| 100 % filter cake + EM +Yeast | 8.00a | 348.0a | 152.0i | 196.00a | 0.78h |
| 50 % filter cake + EM | 5.00d | 294.0e | 186.0d | 108.0f | 1.72d |
| 50 % filter cake + Yeast | 5.00d | 286.0f | 191.0c | 95.00g | 2.01c |
| 50 % filter cake + EM + Yeast | 6.00c | 335.3b | 177.0e | 125.1e | 1.41e |

**- Means within the same column having the same letters are not significantly different according to Duncan's Multiple Range Test (DMRT) at 5 % level of probability.**

**4- Yield and marketable fruits /tree:**

It is obvious from data averaged in Table 8 that, fertilizing the trees with N via 50 to 100% filter cake with or without yeast and EM each at 0.2% significantly improved number of fruits and marketable fruits per tree, gross and marketable yields relative to the application of N completely via mineral N. Applying N as 100% filter cake was more favourable than using N in the mineral form. Number of splitted fruits was significantly depressed in response to subjecting the trees to N as 50 to 100% filter cake alone or in combination with yeast or EM relative to application of N as 100% mineral N. Number of sunburned fruits per tree was significantly raised as a result of applying the present treatments over the control treatment (100% mineral N). This is reasonable due to the higher number of fruits borne on the treated trees with filter cake. The maximum marketable yield/ tree (60.2 and 62.2 kg/ tree) was recorded by the trees that received N as 100% filter cake enriched with yeast and EM at 0.2% for each during both seasons, respectively. The marketable yield of the trees treated with N as 100% mineral N reached 25.1 and 24.8 kg during 2013 and 2014 seasons, respectively. The increment percentage in the yield due to the previous

dominate treatment over the other ones reached 139.8 and 150.8 % during 2013 and 2014 seasons, respectively.

**5- Physical and chemical characteristics of the fruits:**

It is obvious from data in Tables 9, 10 and 11 that, generally supplying Manfalouty pomegranate with N as 50 to 100% filter cake alone or with yeast and EM, as well as using N as 50% filter cake + 50% mineral N were significantly more effective in enhancing fruit quality in terms of increasing fruit weight and dimensions, juice %, TSS % , reducing and total sugars % and total anthocyanins in the juice and fruit peels and in reducing fruit peel weight and thickness, total acidity % and total soluble tannins % relative to the application of N as 100% mineral N. The promotion in fruit quality was significantly associated with increasing the percentages of filter cake from 50 to 100%. Using filter cake fertilized with yeast and/or EM was significantly preferable than using filter cake alone for improving fruit quality. Using N as 100% filter cake was greatly preferable than using N as 100% mineral N alone for improving fruit quality. The best results were obtained by supplying the trees with N as 100% filter cake + yeast + EM at 0.2% for each. Fruit promace % was significantly enhanced with all filter cake, yeast and EM treatments rather than using N in the mineral form or filter cake alone. These results were true during both seasons.

**Table 8. Effect of filter cake, EM and yeast application on yield and yield components of Manfalouty pomegranate trees during 2013 and 2014 seasons.**

| Treatment | Total fruits no./tree | Marketable fruits no./tree | Splitted fruits no./tree | Sun burned fruits no./tree | Gross yield/ tree (kg) | Marketable yield/tree (kg) |
|---|---|---|---|---|---|---|
| | | | First season: 2013 | | | |
| 100 % mineral N | 100.0i | 81.00i | 15.00a | 4.00g | 31.00i | 25.10i |
| 100 % filter cake | 104.0h | 84.00h | 14.00a | 6.00f | 33.90h | 27.40h |
| 50% mineral N + 50% filter cake | 142.0b | 120.0b | 5.00ef | 17.00d | 60.77b | 51.60b |
| 100 % filter cake + EM | 138.0c | 110.0c | 6.00e | 22.00b | 57.10c | 45.50c |
| 100 % filter cake + Yeast | 132.0d | 101.0d | 8.00d | 23.00a | 52.70d | 40.40d |
| 100 % filter cake + EM +Yeast | 149.0a | 130.0a | 4.00f | 16.00d | 69.00a | 60.20a |
| 50 % filter cake + EM | 120.0f | 92.00f | 11.00bc | 17.00d | 42.80f | 32.80f |
| 50 % filter cake + Yeast | 110.0g | 88.00g | 12.00b | 10.00e | 37.50g | 30.00g |
| 50 % filter cake + EM + Yeast | 126.0e | 96.00e | 10.00c | 20.00c | 47.90e | 36.50e |
| | | | Second season: 2014 | | | |
| 100 % mineral N | 98.00i | 80.00i | 16.00a | 2.00g | 30.40i | 24.80i |
| 100 % filter cake | 105.0h | 85.00h | 14.00b | 6.00f | 34.80h | 28.10h |
| 50% mineral N + 50% filter cake | 144.0b | 120.0b | 5.00h | 19.00c | 62.60b | 52.20b |
| 100 % filter cake + EM | 139.0c | 110.0c | 6.00g | 23.00a | 58.20c | 46.10c |
| 100 % filter cake + Yeast | 133.0d | 102.0d | 9.00f | 22.00a | 53.90d | 41.30d |
| 100 % filter cake + EM +Yeast | 155.0a | 133.0a | 4.00i | 18.00cd | 72.30a | 62.20a |
| 50 % filter cake + EM | 121.0f | 93.00f | 11.00d | 17.00d | 43.90f | 31.90f |
| 50 % filter cake + Yeast | 111.0g | 88.00g | 12.00c | 11.00e | 38.40g | 30.40g |
| 50 % filter cake + EM + Yeast | 128.0e | 97.00e | 10.00e | 20.67b | 49.30e | 37.30e |

**- Means within the same column having the same letters are not significantly different according to Duncan's Multiple Range Test (DMRT) at 5 % level of probability.**

**Table 9. Effect of filter cake, EM and yeast application on some physical characteristics of Manfalouty pomegranate fruits during 2013 and 2014 seasons.**

| Treatment | Fruit weight (g) | Fruit diameter (cm) | Fruit height (cm.) | Fruit peel weight (%) | Fruit peel thickness (cm) |
|---|---|---|---|---|---|
| | | | First season: 2013 | | |
| 100 % mineral N | 310.0i | 8.10f | 7.40f | 41.03a | 0.84a |
| 100 % filter cake | 326.0h | 8.20ef | 7.51ef | 39.00b | 0.81ab |
| 50% mineral N + 50% filter cake | 430.0b | 9.05ab | 8.06ab | 29.80gh | 0.55fg |
| 100 % filter cake + EM | 414.0c | 8.90a-c | 7.97ab | 31.00fg | 0.60ef |
| 100 % filter cake + Yeast | 399.6d | 8.74b-d | 7.90bc | 32.70ef | 0.64de |
| 100 % filter cake + EM +Yeast | 462.9a | 9.21a | 8.16a | 28.50h | 0.51g |
| 50 % filter cake + EM | 357.0f | 8.52c-e | 7.66de | 35.50cd | 0.73c |
| 50 % filter cake + Yeast | 341.0g | 8.41d-f | 7.60de | 37.00c | 0.76bc |
| 50 % filter cake + EM + Yeast | 380.0e | 8.63cd | 7.76cd | 34.00de | 0.69cd |
| | | | Second season: 2014 | | |
| 100 % mineral N | 309.7i | 8.07f | 7.50f | 41.00a | 0.85a |
| 100 % filter cake | 331.0h | 8.25ef | 7.60ef | 38.90b | 0.82a |
| 50% mineral N + 50% filter cake | 435.0b | 9.16ab | 8.16ab | 30.00f | 0.59e |
| 100 % filter cake + EM | 419.0c | 8.96bc | 8.09b | 30.90f | 0.59e |
| 100 % filter cake + Yeast | 405.0d | 8.81cd | 8.00bc | 32.60e | 0.64de |
| 100 % filter cake + EM +Yeast | 468.0a | 9.29a | 8.27a | 28.40g | 0.50f |
| 50 % filter cake + EM | 363.0f | 8.60d | 7.71de | 35.40g | 0.72bc |
| 50 % filter cake + Yeast | 346.0g | 8.49de | 7.70de | 36.90c | 0.75b |
| 50 % filter cake + EM + Yeast | 384.9e | 8.70cd | 7.86cd | 33.90de | 0.68cd |

**- Means within the same column having the same letters are not significantly different according to Duncan's Multiple Range Test (DMRT) at 5 % level of probability.**

**Table 10. Effect of filter cake, EM and yeast application on some physical and chemical characteristics of Manfalouty pomegranate fruits during 2013 and 2014 seasons.**

| Treatment | Juice (%) | Fruit promace (%) | T.S.S. (%) | Total sugars (%) | Reducing sugars (%) |
|---|---|---|---|---|---|
| | | | First season: 2013 | | |
| 100 % mineral N | 36.00h | 22.90f | 13.50g | 11.00e | 10.40f |
| 100 % filter cake | 37.30gh | 23.70e | 14.00fg | 11.30de | 10.70ef |
| 50% mineral N + 50% filter cake | 45.00b | 25.20ab | 17.50a | 13.30a | 12.40a |
| 100 % filter cake + EM | 43.60bc | 25.40a | 16.70b | 13.00ab | 12.10ab |
| 100 % filter cake + Yeast | 42.50cd | 24.80a-c | 16.20bc | 12.70b | 11.80bc |
| 100 % filter cake + EM +Yeast | 47.50a | 24.00de | 18.10a | 13.40a | 12.60a |
| 50 % filter cake + EM | 40.10ef | 24.40cd | 15.20de | 12.00c | 11.30cd |
| 50 % filter cake + Yeast | 39.00fg | 24.00de | 14.60ef | 11.60d | 11.00de |
| 50 % filter cake + EM + Yeast | 41.30de | 24.70bc | 15.60cd | 12.30c | 11.50cd |
| | | | Second season: 2014 | | |
| 100 % mineral N | 36.90h | 22.10e | 14.00g | 10.90f | 10.50e |
| 100 % filter cake | 38.40gh | 22.70d | 14.40fg | 11.40e | 10.80e |
| 50% mineral N + 50% filter cake | 46.00b | 24.00ab | 17.30b | 13.40a | 12.50a |
| 100 % filter cake + EM | 44.70bc | 24.40a | 17.00b | 12.90b | 12.20ab |
| 100 % filter cake + Yeast | 43.50cd | 23.90ab | 16.30c | 12.80b | 11.90bc |
| 100 % filter cake + EM +Yeast | 48.50a | 23.10cd | 17.90a | 13.50a | 12.70a |
| 50 % filter cake + EM | 41.10ef | 23.50bc | 15.20de | 11.90d | 11.40cd |
| 50 % filter cake + Yeast | 40.00fg | 23.10cd | 14.80ef | 11.70de | 10.90de |
| 50 % filter cake + EM + Yeast | 42.30de | 23.80b | 15.60d | 12.40c | 11.60c |

**- Means within the same column having the same letters are not significantly different according to Duncan's Multiple Range Test (DMRT) at 5 % level of probability.**

**Table 11. Effect of filter cake, EM and yeast application on some chemical characteristics of the fruit juice of Manfalouty pomegranate trees during 2013 and 2014 seasons.**

| Treatment | Non. Reducing sugars (%) | Titratable acidity (%) | Total soluble tannins (%) | Total anthocyanin (mg/100 g FW) in the juice | Total anthocyanins (mg/ 100 g FW) |
|---|---|---|---|---|---|
| | | | First season: 2013 | | |
| 100 % mineral N | 0.60d | 1.46a | 1.15a | 28.90i | 40.00f |
| 100 % filter cake | 0.60d | 1.44ab | 1.09a | 29.90h | 40.90f |
| 50% mineral N + 50% filter cake | 0.90a | 1.31fg | 0.69f | 36.10b | 45.60ab |
| 100 % filter cake + EM | 0.90a | 1.34e-g | 0.75ef | 35.00c | 44.50b |
| 100 % filter cake + Yeast | 0.90a | 1.36d-f | 0.82de | 34.00d | 43.70c |
| 100 % filter cake + EM +Yeast | 0.80b | 1.29g | 0.91c | 38.00a | 46.60a |
| 50 % filter cake + EM | 0.70c | 1.40b-d | 0.95bc | 32.00f | 42.20d |
| 50 % filter cake + Yeast | 0.60d | 1.42a-c | 1.00b | 31.00g | 41.60e |
| 50 % filter cake + EM + Yeast | 0.80b | 1.38c-e | 0.89cd | 33.00e | 43.00c |
| | | | Second season: 2014 | | |
| 100 % mineral N | 0.40f | 1.47a | 1.11a | 29.00i | 40.80g |
| 100 % filter cake | 0.60d | 1.45ab | 1.04b | 30.00h | 41.70f |
| 50% mineral N + 50% filter cake | 0.90a | 1.32ef | 0.64g | 36.00b | 46.40b |
| 100 % filter cake + EM | 0.70c | 1.35d-f | 0.70f | 34.90c | 44.30cd |
| 100 % filter cake + Yeast | 0.90a | 1.37c-e | 0.77e | 33.90d | 44.60c |
| 100 % filter cake + EM +Yeast | 0.80b | 1.30f | 0.86d | 37.80a | 47.40a |
| 50 % filter cake + EM | 0.50e | 1.41a-d | 0.90cd | 31.80f | 42.90e |
| 50 % filter cake + Yeast | 0.80b | 1.43a-c | 0.95c | 30.90g | 42.40e |
| 50 % filter cake + EM + Yeast | 0.77b | 1.39b-d | 0.84d | 32.90e | 43.60d |

**- Means within the same column having the same letters are not significantly different according to Duncan's Multiple Range Test (DMRT) at 5 % level of probability.**

**6- Economic study:**

The economic consideration comparative study of Manfaloty Pomegranate cultivar in 2013 and 2014 seasons that shown in Table 12 observed that, the trees which treated by 100% filter cake + yeast + EM led to get the highest fruit yield which had the highest net return (51309.4 EP). On the other hand, control treatment gave the lowest net return (18419.15 EP) in both studied seasons, so we can recommended with fertilizing pomegranate trees with filter cake (100%) + yeast + EM that leading to get higher profit comparing with other treatments.

**Table 12. Economic evaluation of pomegranate fruits production of Manfaloty cultivar fertilizing the trees with filter cake enriched with yeast and/or EM and mineral fertilizers (N).**

| Treatments | Average of marketable yield kg/Fed | Cross income /treatment (EPG/Fed) | Total Cost | | | | Total Cost (EPG) | Average net return (EPG) |
|---|---|---|---|---|---|---|---|---|
| | | | Fixed Cost+ farm compost | Cost of filter cake | Cost of yeast | Cost Of EM | | |
| 100 % mineral N | 6536.9 | 22879.15 | 4460 | ------ | --------- | --------- | 4460 | 18419.15 |
| 100 % filter cake | 7270.5 | 25446.75 | 4460 | 270 | ---- | ----- | 4730 | 20716.75 |
| 50% mineral N + 50% filter cake | 13597.8 | 47592.3 | 4460 | 135 | ----- | ------ | 4595 | 42997.3 |
| 100 % filter cake + EM | 11999.6 | 41998.6 | 4460 | 270 | ------ | 54 | 4784 | 37214.6 |
| 100 % filter cake + Yeast | 10702.7 | 37459.45 | 4460 | 270 | 27 | ----- | 4757 | 32702.45 |
| 100 % filter cake + EM +Yeast | 16034.4 | 56120.4 | 4460 | 270 | 27 | 54 | 4811 | 51309.4 |
| 50 % filter cake + EM | 8475.7 | 29664.95 | 4460 | 135 | ----- | 54 | 4649 | 25015.95 |
| 50 % filter cake + Yeast | 7912.4 | 27693.4 | 4460 | 135 | 27 | ----- | 4622 | 23071.4 |
| 50 % filter cake + EM + Yeast | 9667.8 | 33837.3 | 4460 | 135 | 27 | 54 | 4676 | 29161.3 |

## DISCUSSION

The benefits of using EM and filter cake on enhancing soil fertility, may be due to the availability of nutrients and the secretion of $GA_3$, IAA and antibiotics surely reflected on enhancing yield and fruit quality (**Dee *et al.,*** 2002 and Kannayian, 2002). Using EM has beneficial effect in inoculating of different cultures of microorganisms into soil, where they shift the microbiological equilibrium and create an environment that is favourable to the growth and health of plants. It is capable for enhancing N fixation, organic matter, nutrient and water uptake and root development, as well as for reducing soil pH that is responsible for increasing the availability of different nutrients (Higa, 1991 and Joo *et al*. 1999). Yeast contains vitamin B (thiamin), $B_6$ (pyridoxine) and glycine (Abou-Zaid, 1984). Also, it is very beneficial and essential for the synthesis of aminoleulinic acid (AA) and for the formation of protoporophrin, the precursor of chlorophyll. It aids in activating photosynthesis process through enhancing the release of carbon dioxide (NRP, 1977 and Barnett *et al.,* 1990). The application of yeast to improve growth, vine nutritional status, yield, as well as physical and chemical properties of citrus is getting much importance.

Previous studied showed that using yeast was very effective in enhancing growth and flowering aspects, tree nutritional status, yield and fruit quality in different fruit crop species (Hosam El-Deen *et al.,* 2001; Ahmed, 2001; Moustaffa and El-Hosseiny, 2001; Mostafa, 2004, Badawi Sabah, 2005, Mouftah, 2007; Mohamed *et al.,* 2008; Oraby, 2013 and Abdalla, 2014) and EM (Abd- Rabou, 2006; Mofeed, 2009; Badran and Mohamed, 2009; Ahmed- Samah, 2011; Roshdy *et al.,* 2011; Ibrahim, 2012, Hassan- Huda, 2014, Abd El-Reheem-Sahar, 2015 and Abdel–Aziz, 2015).

## CONCLUSION

For promoting remarkable yield, fruit quality and higher profit of Manfalouty pomegranate trees grown under sandy soil condition, simultaneously with controlling fruit splitting, it is suggested to use filter cake at 100% of the recommended N dose (300 g/tree/year) via (17.86 kg/tree) plus 0.2% of yeast and 2 L from $EM_1$ (2 kg from both yeast and EM/ ton filter cake), four times concerning from the first week of Jan. with two months interval.

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## تأثير طينة المرشحات وبعض المركبات الحيوية على نمو ومحصول أشجار الرمان المنفلوطي النامية في أرض رملية طارق خلف البلك

**قسم بحوث الزيتون وفاكهة المناطق شبه جافة معهد بحوث البساتين- مركز البحوث الزراعية- الجيزة**

أجريت هذه الدراسة خلال موسمي 2013 ، 2014 على أشجار الرمان المنفلوطي البالغة من العمر 12 عاما المنزرعة في مزرعة خاصه تقع في منطقه عرب العوامرفى مدينة ابنوب بمحافظة أسيوط – مصر وتروى بنظام الرى بالتنقيط ومنزرعة على مسافات 4 × 4م بين الأشجار، وكان الهدف اختبار تأثير استخدام طينة المرشحات المزودة بالخميرة ومركب الكائنات الحية الدقيقة الفعالة ( EM) كبديل جزئي للأسمدة النتروجينية المعدنية على صفات النمو والإزهار والحالة الغذائية للشجرة وكمية المحصول والنسبة المئوية لتشقق الثمار وجودة الثمار في أشجار الرمان المنفلوطي (*Punica granatum* L.) النامية في التربة الرملية. أوضحت النتائج المتحصل عليها أن تسميد الأشجار بسماد طينة المرشحات بنسبة 50 إلى 100% من الكمية الموصى بها للشجرة من النتروجين أما بمفردها أو مع الخميرة ومركب الكائنات الحية الدقيقة الفعالة ( EM) بتركيز 0.2% كان مؤثرا جدا في تحسين جميع صفات النمو الخضري ومحتوى الأوراق من الصبغات، النتروجين، الفوسفور، البوتاسيوم، الماغنسيوم، الكالسيوم، الزنك، الحديد، المنجنيز والنحاس وكذلك عدد الأزهار على الشجرة، عدد الأزهار الخنثى، كمية المحصول القابل للتسويق والخصائص الطبيعية والكيمائية للثمار وذلك بالمقارنة مع الكنترول (باستخدام النيتروجين في الصورة المعدنية) إلا أن عدد الأزهار المذكرة/شجرة، وعدد الثمار المتشققة/شجرة، النسبة المئوية لوزن وسمك القشرة، النسبة المئوية للحموضة الكلية في العصير والتانينات الكلية الذائبة فقد انخفضت انخفاضا ملحوظا عند التسميد بطينة المرشحات إما بمفردها أو مع الخميرة ومركب الكائنات الحية الدقيقة الفعالة ( EM).وعليه فإنه لتحسين كمية المحصول القابل للتسويق وخصائص الجودة للثمار وبالتالى على أعلى عائد لأشجار الرمان المنفلوطي النامي في التربة الرملية وفى نفس الوقت تقليل النسبة المئوية للثمار المتشققة فانه يوصى باستخدام طينة المرشحات بنسبة 100% من النتروجين الموصى به (300 جرام للشجرة/ العام) (17.86 كيلو جرام للشجرة/ السنة) مع إضافة 2 كجم و لتر من كلا من الخميرة ومركب الكائنات الحية الدقيقة الفعالة.

**الكلمات الدالة**: طينة المرشحات- الخميرة- مركب الكائنات الحية الدقيقة الفعالة- أشجار الرمان المنفلوطي - تشقق الثمار – خصائص الجودة للثمار.