Journal of Applied Sciences Research, 7(7): 1218-1221, 2011
ISSN ISSN 1819-544X
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ORIGINAL ARTICLES

Selecting the Best Method and Dose of Yeast for Kelsey Plum Trees

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ABSTRACT

During 2010 and 2011 seasons, Kelsey plum trees received yeast at different methods (via soil, via foliage and via soil and foliage) and doses (2.5, 5.0, 7.5 g/ tree/ one addition). Yeast was added at three times/ year. The effect of yeast treatments on yield and fruit quality was investigated. Application of yeast at different methods and doses was preferable in enhancing yield quantitively and qualititively rather than non- application. Application of yeast via soil surpassed the application of yeast via foliage in enhancing yield and fruit quality and the promotion was associated with increasing doses or concentrations. Negligible stimulation was detected among the higher two doses of yeast. Combined application of yeast via soil and foliage surpassed the application via soil or via foliage alone. Treating Kelsey plum trees three times with yeast via soil at 2.5 g/ tree (7.5 g. yeast/ tree/ year) + via foliage at 0.25 % gave the best results with regard to yield and fruit quality.

Key words: Plum trees, yeast, dose, Kelsey Plum

Introduction

Recently, a yeast attention has been focused on the possibility of using natural and safety substances in order to improve plant growth, yield and quality of many crops. Biofertilizers have been extensively used as an eco- friendly approach to minimize the use of chemical fertilizers, improve soil fertility status and for the enhancement of crop production by their biological activity in the rhizosphere (Kannaiyan, 2002).

Yeast (*Saccharomyces cervisiae*, L) is considered as one of the promising biofertilizer for many crops. The positive effect of yeast application could be due to its effect in activating photosynthesis process through enhancing the release of CO^2 as well as its higher own content from natural growth regulators namely IAA, GA_3 and cCytokinins, amino acids and B- vitamins. Also, yeast is responsible for encouraging the uptake of different nutrients (Abou- Zaid, 1984 and Barnett *et al*., 1990).

Using yeast in different fruit crops was accompanied with enhancing yield and fruit quality (Abo- Taleb- Safia *et al*., 1999; Chen, 2000; El- Sayed, 2001; Numair- Safaa, 2001; Bakry and Wanas, 2003; Abd El- Wahab *et al*., 2008 and Hegab *et al*., 2010). All of them found that yeast effect was governed by methods and levels of yeast.

The merit of this study was adjusting the best method and level of yeast that responsible for producing good yield and improving fruit quality of Kelsey plum trees.

Materials and methods

This study was carried out during 2010 and 2011 seasons on thirty uniform in vigour 12- years old Kelsey plum trees onto Mariana plum rootstock in a private plum orchard situated at West Matay, Minia Governorate. Although, there no problem in pollination of such plum cv. trees of plum cv. Mary Pousa were carefully distributed with Kelsey plum trees with assistance of two hives of honey bees/ fed. for securing cross pollination. The selected trees are planted at 4.0 × 4.0 meters apart. Soil texture is sandy clay. All the trees received the common horticultural practices that already applied in the orchard.

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The Present Experiment Included the Following Ten Treatments from Various Methods and Doses of Yeast:

1. Control (Untreated Trees):
2. Application of yeast via soil at 2.5 g/ tree.
3. Application of yeast via soil at 5.0 g/ tree.
4. Application of yeast via soil at 7.5 g/ tree.
5. Application of yeast via foliage at 0.25 %.
6. Application of yeast via foliage at 0.50 %.
7. Application of yeast via foliage at 0.75 %.
8. Application of yeast via soil at 1.25 g/ tree + via foliage at 0.125 %.
9. Application of yeast via soil at 2.5 g/ tree + via foliage at 0.25%.
10. Application of yeast via soil at 3.75 g/ tree + via foliage at 0.375 %.

Each treatment was replaced three times, one tree per each. Yeast at different levels and concentrations were added three times for each season at growth start (1st week of Feb.), just after fruit setting (2nd week of April) and at three weeks later (1st week of May). The pure yeast powder was activated by using sources of carbon and nitrogen with ratio of 6: 1. This ratio is suitable to get the highest vegetative production of yeast. Each ml of activated yeast contained about 12000 yeast cells (Barnett *et al*., 1990). Such technique allowed yeast cells to grow multiplied efficiently during conductive aerobic and nutritional conditions. To produce de novo beneficial bioconstituents i.e phytohormones, carbohydrates, proteins, amino acids, fatty acids, vitamins, enzymes, minerals…. etc., hence allowed such constituents to release out of yeast tissues in readily form. Such technique for yeast preparations based on 1) nutritional media of glucose and casein as favourable sources of C, N and other essential elements (P, K, Mg, Fe, Mn, Cu, B and Mo, Na and Cl) in suitable balance (Barnett *et al*., 1990) and 2) air pumping and adjusting incubation temperature. The media then subjected to two cycles of freezing and thawing for disruption of yeast tissues and releasing their bioconstituents directly before using. Chemical analysis of yeast is shown in Table (1) according to Gaser- Aisha *et al*., (2006).

Table 1: Chemical analysis of the yeast:

N %	Fats %	Ash %	Vitamin B_1 (100 g)	Riboflavin B_2 (100 g)	Niacin B_4 (100 g)	B_6- vitamin (100 g)	B_{12} – vitamin (100g)
7.3	3.5	6.7	2.33 mg	5.41 mg	36.7 mg	4.41 mg	0.02 mg

Completely randomized block design was followed. At the last week of June, when fruits reached maturity (yellow color covered most fruit surfaces), trees were harvested and the yield expressed in weight (kg.) was recoded. Ten fruits/ tree was randomly taken from all sides of the trees for determination of fruit weight (g.), total soluble solids %, total and reducing sugars (Lane and Eynon volumetric method, 1965, A.O.A.C, 1995) and total acidity % (as a g malic acid/ 100 g pulp) according to A.O.A.C. (1995).

All the obtained data were tabulated and statistically analyzed according to Mead *et al*., (1993) using new L.S.D test at 5 % for made all comparisons among all the studied treatment means.

Results and discussion

Effect of Yeast on the Yield:

Data in Table (2) clearly show that application of yeast via soil, via foliage or via soil+ foliage at 2.5 to 7.5 g/ tree/ one addition significantly improved the yield comparing with non- application. Soil application of yeast at different doses surpassed the application of yeast via foliage in this respect. Using yeast via soil and foliage was superior the application of each method alone. Yield was gradually increased with increasing levels and concentrations of yeast. Increasing levels of yeast from 5.0 to 7.5 or concentrations from 0.50 to 0.75 % had no significant promotion on the yield. The maximum yield (24.0 and 23.1 kg. during both seasons, respectively) was recorded on the trees received yeast via soil at 2.5 g/ tree/ one addition + via foliage at 0.25 % three times. The minimum yield (15.0 and 15.5 kg/ tree) was recorded on the trees that untreated with yeast. These results were true during the two seasons.

The promoting effect of yeast on growth characters and nutritional status of the trees in favour of producing more fruits gave a good explanation of the present results.

These results are in concordance with those obtained by Chen (2000); Abd El- Wahab *et al*., (2008) and Hegab *et al*., (2010).

Table 2: Effect of different methods and doses of yeast on the yield as well as some physical and chemical characteristics of fruits of Kelsey plum trees during 2010 and 2011 seasons.

Yeast treatments	Yield/ tree (kg.)		Fruit weight (g.)		T.S.S %		Total sugars %		Reducing sugars %		Total acidity %	
	2010	2011	2010	2011	2010	2011	2010	2011	2010	2011	2010	2011
Control.	15.0	15.5	42.0	42.6	14.1	14.2	11.0	11.2	5.0	5.0	0.931	0.929
Via soil at 2.5 g/ tree./one addition	18.6	19.1	48.0	48.9	15.3	15.3	12.3	12.4	5.8	6.0	0.850	0.841
Via soil at 5.0 g/ tree./one addition	19.7	20.3	50.0	50.5	15.7	15.9	12.6	12.7	6.0	6.2	0.811	0.800
Via soil at 7.5 g/ tree ./one addition	20.0	20.5	50.5	50.9	15.8	16.0	12.7	12.8	6.1	6.3	0.808	0.797
Via foliage at 0.25 %.	16.1	16.7	44.0	44.8	14.4	14.5	11.4	11.5	5.2	5.3	0.911	0.900
Via foliage at 0.50 %.	17.2	17.9	46.0	47.0	14.8	14.9	11.8	11.8	5.4	5.6	0.880	0.869
Via foliage at 0.75 %.	17.4	18.0	46.6	47.3	14.9	15.0	11.9	11.9	5.5	5.7	0.872	0.862
Via 1.25 g soil + via 0.125 % foliage	21.5	22.0	52.2	53.0	16.1	16.3	13.0	13.0	6.3	6.6	0.770	0.760
Via 2.50 g soil + via 0.25 % foliage	24.0	23.1	55.0	55.0	16.6	16.7	13.2	13.2	6.6	6.8	0.710	0.690
Via 3.75 g soil + via 0.375 % foliage	24.4	25.3	55.3	55.6	16.7	16.7	13.3	13.3	6.7	6.9	0.702	0.682
New L.S.D at 5 %	1.0	1.0	1.4	1.5	0.2	0.2	0.3	0.2	0.2	0.2	0.019	0.018

Effect of Yeast on Fruit Quality:

It is clear from the data in Table (2) that varying methods and doses of yeast significantly varied fruit quality parameters. Using yeast via soil, via foliage or via via both methods at different doses and concentrations significantly was accompanied with improving fruit quality in terms of increasing fruit weight, total soluble solids and total and reducing sugars and decreasing total acidity % comparing with non-application. Soil application of yeast was preferable in enhancing fruit quality than foliage application method. Using yeast via soil and foliage was superior the application of yeast via any method in enhancing fruit quality. Increasing doses and concentrations of yeast was accompanied with a gradual promotion on fruit quality. Negligible promotion was occurred among the higher two doses and concentrations. The best results were obtained with using yeast via soil at 2.5 g/ tree/ one addition plus via foliage at 0.25 % three times. Untreated trees recorded the lowest values of fruit quality parameters. These results were true during 2010 and 2011 seasons.

The outstanding effect of yeast on building plant pigments and sugars surely reflected on improving quality of the fruits.

These results are in concordance with those obtained by Chen (2000); Abd El- Wahab *et al*., (2008) and Hegab *et al*., (2010).

As a conclusion, it is advised for using yeast three times via soil at 2.5 g/ tree/ one addition plus via foliage at 0.25 % for maximizing the yield and improving quality of Kelsey plum fruits.

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