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Economical management of Date fertilization using statistic quality control Case Study: Date groves of Sistan and Baluchestan Province, IRAN

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ABSTRACT

Due to the date tree resistant against salty soils and poor quality thus, study in the soil of date groves is essential. In compliance with the principles of fertilizing operation and maintenance the soil quality can significantly increase the yield of date. This study has been done in southeastern of Iran (Sistan and Baluchestan province). Sistan and Baluchestan province is the statistic community. Because it is the largest producers of date and there are highest level of cultivation in this region. The purpose of this study is providing a remedial solution for the optimal use of fertilizers in date groves with using quality control charts. It has been conducted in southeastern of Iran (Sistan and Baluchestan province). For this purpose, 54 soil samples were prepared and the amount of soil organic carbon matter, potassium and phosphorus were measured. Results showed that soil groves, are far from optimal level, and improving the pattern of fertilizer can increase economical gain.

Key word: management, economic, fertilizer, date, Sistan and Baluchestan

Introduction

Dactylifera Phoenix is a palm in the genus Phoenix. Most species of this plant is ornamental. This plant is resistant against heat, soil salinity and dehydration, and had a better grown in sandy, limestone and clay soils. Good ventilation of the soil is important factor for rise of this plant. It can be grown in the warm weather and sunshine. Sistan and Baluchestan province is the largest producers of date in Iran. Under cultivation date in this region is equal to 11552 hectares that are produced in the cities of Zahedan, Mirjaveh, Iranshahr, Saravan, Nikshahr and Sarbaz. Total production of the province is equal to 170000 tons. The palm of Sistan and Baluchestan province exports to the European and Arabic countries. With yield of 11552 tons and with 12881518 $ value. (Statistical Yearbook of Agriculture Organization of Sistan and Baluchistan province, 2009). Date cultivates about 2000 years old in this area. Most important date varieties are Mazafati and Rabbi. Since, the palm has an important role in economics, thus point to correct use of fertilizers and agricultural operations can increase the quality and quantity of palm. The objective of this study is optimizing the consumption of fertilizers in the Sistan and Baluchestan province.

Materials and Method

Most use of control charts is Deviations cause detecting in the manufacturing process. Deviations in the manufacturing process be divided into two groups:

1. The random Single deviations caused by event.
2. Deviations with reasons, to determine the possible cause.

If the X is as an estimate for μ and R/d_2 is as an estimate for σ, thus the around of X chart control is:

$$UCL = X - \frac{3}{d_2 n^{\frac{1}{2}}}$$

X= Central line (1)

$$LCL = X - \frac{3}{d_2 n^{\frac{1}{2}}}$$

Not that the amount of $A_2=3/d_2n^{1/2}$is constant that related to sample size. Thus the definition of around Control of X Charts is as a follow:

$$UCL=X+A_2R$$

X= Central line (2)

$$LCL=X-A_2R$$

The range of smple related to standard deviation in process. Therefore we can Survey Process

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variability with drawing the amount of R, on the chart control.

$$\sigma_R = d_3\sigma \quad (3)$$

Consequently, the around of control with three standard deviations for R chart is:

$$UCL = R + 3\sigma_R$$

$$R = \text{Central line} \quad (4)$$

$$UCL = R - 3\sigma_R$$

In this study, the optimal amount of fertilizer (P, K and OC) was evaluated with using statistical quality control, and the software of calculation was Minitab. To determining the optimal amount of fertilizer and the economical stage, 54 groves were sampled and quality control charts were plotted for the three major indexes (P, K and OC).

Table 1: Fertilizer consumption in the investigated cities

$P_{(ppm)}$	$K_{(ppm)}$	$OC_{(ppm)}$	City	$P_{(ppm)}$	$K_{(ppm)}$	$OC_{(ppm)}$	City
1.2	310	0.1	Saravan	5.8	150	0.04	Iranshahr
1.6	140	0.99	Saravan	5	120	0.05	Iranshahr
1.4	120	0.34	Saravan	7	140	0.03	Iranshahr
5.2	140	1.2	Saravan	0.8	100	0.03	Iranshahr
1	560	0.23	Saravan	10	290	0.48	Iranshahr
2.8	530	0.19	Saravan	22.8	150	0.41	Iranshahr
1.2	380	0.04	Saravan	3.6	230	0.2	Iranshahr
1.6	300	0.15	Saravan	1.1	80	0.31	Sarbaz
2.8	100	0.14	Saravan	1	70	0.22	Sarbaz
1.8	140	0.03	Saravan	6.4	40	0.345	Sarbaz
2.2	80	0.28	Saravan	0.4	140	0.22	Sarbaz
6.4	330	0.11	Nikshahr	4.6	300	0.65	Sarbaz
3.6	180	0.22	Nikshahr	1	90	0.05	zabol
1.4	220	0.04	Nikshahr	3.6	230	0.2	khash
0.8	180	0.07	Nikshahr	2.8	100	0.14	kahir
15.6	100	0.09	Nikshahr	3.2	50	0.08	kahir
15.6	100	0.09	Nikshahr	5.4	270	0.17	kahir
9.2	100	0.04	Nikshahr	0.6	150	0.11	kahir
7.2	200	0.18	Nikshahr	5.4	270	0.17	kahir
0.4	140	0.103	Nikshahr	3.2	50	0.08	kahir
1	80	0.19	Nikshahr	8.6	140	0.48	Saravan
4	110	0.3	Nikshahr	11.6	130	0.55	Saravan
8	90	0.04	Nikshahr	0.2	200	0.13	Saravan
0.6	120	0.09	Nikshahr	5.8	180	0.22	Saravan
0.4	180	0.09	Nikshahr	1.8	220	0.4	Saravan
1.2	100	0.04	Nikshahr	1.1	90	0.07	Saravan
7.2	150	0.13	Nikshahr	2.2	200	0.14	Saravan

Source: research findings

Table 2: Performance changes based on the use of fertilizers

Fertilizer consumption in kilograms per hectare		Changes in production performance in Tones per hectare
Triple Super Phosphate	11	3.5
Potassium sulfate	65	
Organic fertilize	15000	
Triple Super Phosphate	23	7
Potassium sulfate	8	
Organic fertilizer	25000	

Source: Statistical yearbook of agriculture organization of Sistan and Baluchestan, 2009.

Table 2: showed the, yield per hectare and fertilizer consumption in the various groves.

Results:

a. Potassium (K):

Potassium causes food and iron, move easily from one part to the other parts of plants. This element is effective in the activation of enzymes, and opening-closing of leaf stomata. The results showed that the potash of soil needs in most area. Therefore, the consumption of fertilizers is not common, and only in some cases to be used mixed with soil before sowing. If the animal manure added to the land in the beginning of cultivation, increases the potassium of the soil, and enhances its ability to absorb. The limit of potassium for the palm tree is between 250 to 300 ppm.

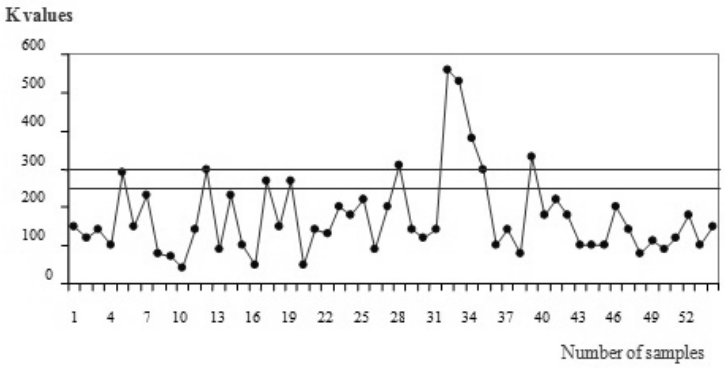

Fig. 1: Index of Samples potassium

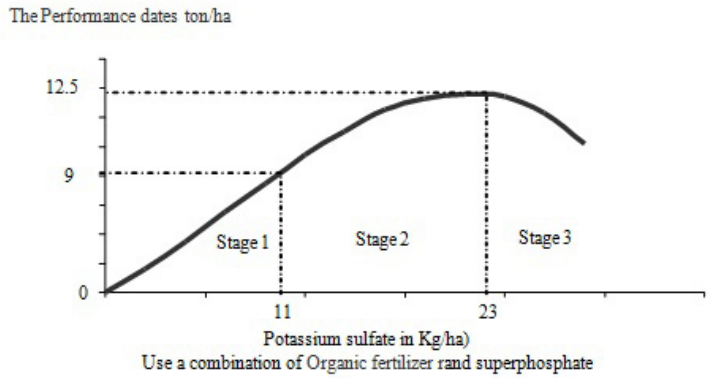

Fig. 2: production function for potassium sulfate

Figure (1) shows that the level of potassium is less than optimal in most cases. This deficiency will produce negative effects on the fruit quality and quantity. In this case, clusters of palm trees are with symptoms such as dryness. To overcome this problem, must be used potassium sulfate fertilizer.

The diagram shows that when the production located is in the economical stage, consumption of fertilizer is between 11 and 33 kilograms per hectare.

b. Phosphorus (P):

Phosphorus helps to fertility and plant growth. This element is most needed in the initial stages of plants and cold weather. The optimum (P) of palm tree is between 5 to 15 ppm. Figure 3 shows samples of phosphorus (P) index.

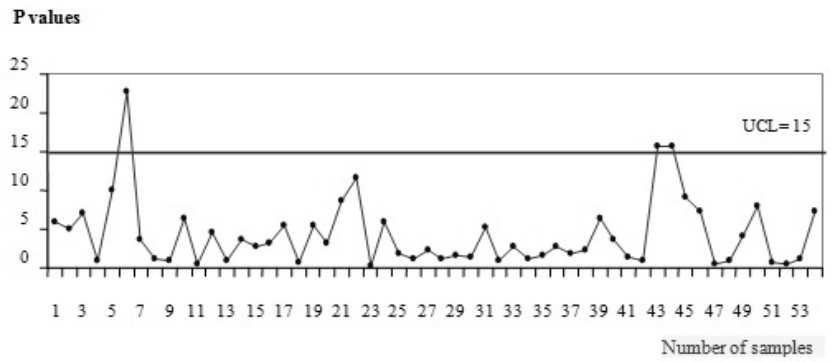

Fig. 3: Samples of phosphorus (P) index

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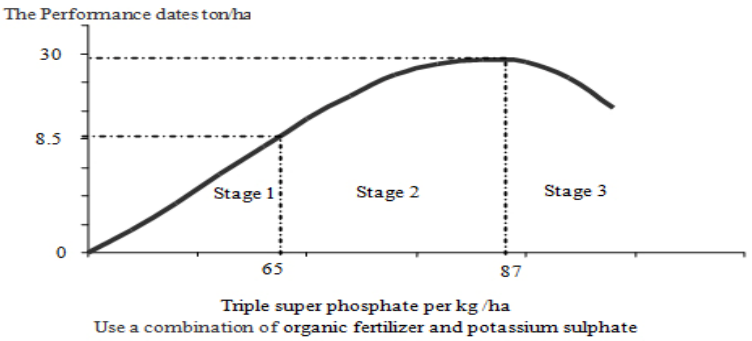

Fig. 4: Stages of fertilizer consumption

Quality control figure (3) shows, that most samples contain phosphorus are lower than optimal. To solve this problem used potassium fertilizer. The production stage of fertilizer is shown below.

The above figure shows, while optimal consumption is between 65 and 87 kilograms of per hectare.

C. Soil organic carbon (OC):

Organic material formed remnants of plants, animals and microorganisms. These substances are responsible many tasks, and recognized as index of nitrogen. If level of soil carbon was low, the beneficial microorganisms are destroyed, soil structure are damaged and decreases the keeping soil moisture. The optimal level OC of soil of palm is between 5 and 7.5 ppm, Figure 5 shows quality control of samples.

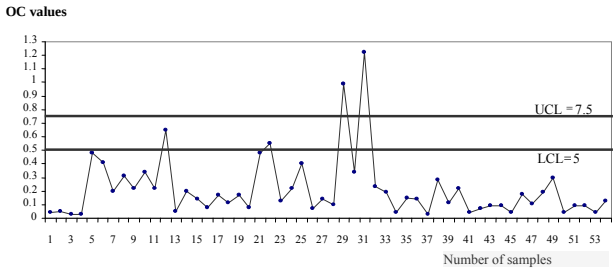

Fig. 5: Quality control samples of the Organic Carbon

If farmer consume more than 25 kilograms of organic fertilizer entered stage 3 of production. The diagram shows most samples are below the optimum level of organic matter and are very weak. To overcome this problem must be used the organic fertilizer. Figure 6 - show the best level consumption of fertilizer for OC, fertilizer Optimal consumption is between 15 and 20 kg ha.

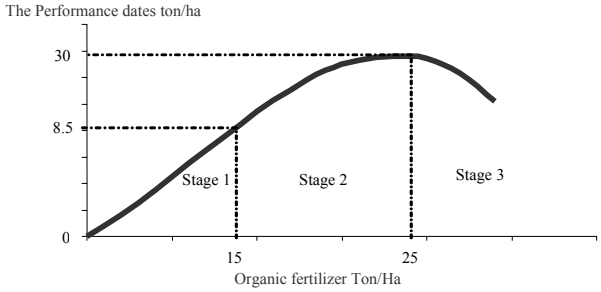

Fig. 6: Optimal consumption of organic matter

Soil quality of groves is important from economical point view of in Sistan and Baluchistan province. Thus, the farmer should be more attention to quality of palm. It is recommended that data of

soil quality for each season collected and stored in the database. Orchards classification based on quality of soil, for better fertilization process.

Conclusion:

Soil quality is important of groves as economical perspective in Sistan and Baluchestan, thus should be more attention to quality of date in economics of region. Therefore, recommended the data of soil quality, date groves and database storage to be collected for each season in order to Improving efficiency of fertilizer. The following suggestions can be effective in this regard:

- Providing and distribution of fertilizers required by the relevant agencies ;
- Creating extension centers for transferring information to farmers;
- Due to unstable incomes of palm developed a long-term plan for market of palm;
- Breakdown type of land available for farming operations to provide better fertilization;
- Due to positive effective of fertilization on the production of palm, recommended that operations be conducted with more credibility and power;
- Since the current level of fertilizer consumption, can be increased production, so in order to learning about palm trees and fertilization operation have the necessary training to farmers on the importance time of fertilization;
- Adequate and complete control over the standard minimum requirements for acceptable palm Orchards;
- Using animal fertilizers, according to optimal level to relieve soil organic matter;
- Using phosphate fertilizers and prevent overuse of nitrogen fertilizers;
- Fed through palm tree leaves with a foliar application of potassium sulfate.
- Due to positive role of potassium in reducing losses of soil and plant, public knowledge about the amount of potassium and other nutrients in the soil should be increased;
- Excessive use of nitrogen fertilizers should be avoided, because the plant is sensitive towards environmental stress and disturb the balance between nutrients, it reduces absorbed Potassium.
- Cultivation forage plants resistant to salt and dehydration in the orchards, to prevent erosion and retain elements of soil.

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