FOLIAR FERTILISATION INFLUENCE ON POMEGRANATE FRUIT PRODUCTION AND QUALITY IN GREENHOUSE CONDITIONS

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Abstract.

The pomegranate (Punicagranatum) is cultivated as an ornamental and fruit shrub for itsbig, simple or double red flowers and edible fruit of 7-12 cm in diameter (Preda M.,1979).

Today the pomegranate is found on a large area, cultivated in the open in hot regions, whereas in those with less favourable climatic conditions, where the minimum temperature drops in winter below the limit of resistance of plants, it is cultivated in protected areas or in vegetation pots that are kept in the open during the warm season (Şeleru E., 1989).

In Romania, the pomegranate is not widespread as an ornamental plantor for its economic use. This situation can be attributed to the lack of seedlings on the one hand and to the lack of cultivation technology on the other (SoneaV.,1983).

Key words: Punicagranatum, foliar fertiliser, foliar feed.

INTRODUCTION

Between 2006 and 2015, experiments regarding the influence of foliar fertilisation on yield and fruit quality pomegranate were conducted in the greenhouse in the town Sântandrei, Bihor County. Planting was done in the greenhouse soil in March 2006 with cuttings that were planted in beech sawdust and sand in a ratio of 1:1. In Germany, a substrate of 80% river sand with 1-2 mm grains in diameter and 20% pine needles is used with good results (John Brookes, 1999).

In Romania, it was recommended to use a mixture of peat and perlite in a ratio of 2:1 (Zaharia, 1992) and beech sawdust and sand in a ratio of 1:1 (Vlad, 2004). Research undertaken by Platon et al (1990) and Oprea (2010) regarding foliar fertilisers have lead to a significant increase in thickness growth of the tree trunk, an increase of the chlorophyll pigments content in the leaves (6-12%) and of the fruit production of up to 31.7%.

Foliar fertilisation exercises an overall influence that manifests itself by stimulating the growth of shoots and leaf area, of the production potential

by increasing the fruit binding degree, the plants' resistance to pests and diseases (Rusu et al, 2005).

Research undertaken by Hamilton (1984) pointed out that foliar fertilisation increases the capacity of nitrogen absorption of the leaves. Increasing the quantitative and qualitative fruit production by using small quantities of foliar fertilisers with low production costs, taking into consideration that these can be administered together with foliar treatments, makes this method of fertilisation effective and promising (Ropan, 2000, Boyton, 2002, Ghenea et al, 2004).

The absorption of solutions through the leaves is done three ways, namely the passing of nutrients through the cuticle and cell membrane through diffusion, passing through the plasma membrane and direct penetration of the cytoplasm (Forshey 1999, Fisher 2003 and Borlan 2004).

MATERIAL AND METHODS

The experiments were conducted in a pomegranate plantation in the greenhouse soil in the town Sântandrei, Bihor. Planting was done at a distance of 3.7/3m on two rows in a 6.4 m wide span. Plants then had their crowns and trunks formed with the help of pruning because the flowers only formed at the tip of strong annual shoots. The weaker branches did not bloom, therefore we pruned them. We obtained the first fruit three years after planting and the plantation produced fruit at full capacity in the seventh year since planting.

Starting in October, the plants entered a rest period in which we gradually reduced watering. During this time, the plants lost their leaves.

During the rest period, the temperature was kept between 0 and 50^0C.

Taking the plants out of the rest period was done mid-March by resuming watering and gradually raising the temperature to 18-20^0C at night, 2-24^0C during cloudy days and 26-28^0C on sunny days. During periods of growth we fertilised with Foliar Feed, with an active material content of 22%N, 21%P_2O_5, 17% K_2O and Fe, Cu, Zn, Bo and S microelements. Applying foliar fertilisers began in April 2012 and continued until the end of July. One month after taking the plants out of the rest period, in March 2012, the nutrient content of the greenhouse soil was the one in Table 1.

Table 1

Greenhouse soil analysis (average values)Sântandrei2012

Content of water soluble mineral substances (1:5) mg/100 g dry soil					Humidity %	Mineral residue%	Ph
N	P_2O_5,	K_2O	Ca	Mg			
25	12	57	49	12	67	0,47	6,9

We worked with seven variants, placed in blocks subdivided in three repetitions (Table 2). The surface of the experimental plot was 33.3 m^2, 99.9 m^2 for one variant and 699.3 m^2 for the entire experiment.

Table 2

Experimental variants

Variants	Concentration of foliar fertilisation solution %	Frequency of fertilisation
V_1-unfertilised crop	Control sample	-
V_2- Foliar Feed fertilisation	0.1	once every two weeks
V_3- Foliar Feed fertilisation	0.1	once a month
V_4- Foliar Feed fertilisation	0.2	once every two weeks
V_5- Foliar Feed fertilisation	0.2	once a month
V_6- Foliar Feed fertilisation	0.3	once every two weeks
V_7- Foliar Feed fertilisation	0.3	once a month

RESULTS AND DISCUSSIONS

Table 3 shows that the harvested and sold fruit production ranged between 12.1 t/ha for the control sample crop (unfertilised) to 23.3 t/ha for variant 6, fertilised with Foliar Feed 0.3% once every two weeks.

In relative terms, we notice production was exceeded with 93% in variant 6 (fertilised with Foliar Feed 0.3% once every two weeks), with very significant difference from the control sample. Variant 4 (fertilised with Foliar Feed 0.2% once every two weeks) and variant 7 (fertilised with Foliar Feed 0.3% once a month) have a distinctive significant difference from the control sample (unfertilised). Variant 5 (fertilised with Foliar Feed 0.2% once a month) and variant 2 (fertilised with Foliar Feed 0.1% once every two weeks) have a significant difference from the control sample.

Although it yielded a production 1.2 t/ha (9%) greater than the control sample, the difference made by variant 3(fertilised with Foliar Feed 0.1% once a month) is not significant.

Table 3

Pomegranate fruit production influenced by fertilisation in phases
(average values 2012-2014)

Variants	Fruit production		±D	Difference significance
	Absolute t/ha	Relative %		
V_1-unfertilised crop (control sample)	12.1	100	-	-
V_2- Foliar Feed 0.1% fertilisation every two weeks	16.4	135	4.3	*
V_3- Foliar Feed 0.1% fertilisation once a month	13.3	109	1.2	-
V_4- Foliar Feed 0.2% fertilisation every two weeks	20.1	166	8	**
V_5- Foliar Feed 0.2% fertilisation once a month	16.6	137	4.5	*
V_6- Foliar Feed 0.3% fertilisation every two weeks	23.3	193	11.2	***
V_7- Foliar Feed 0.3% fertilisation once a month	20.3	167	8.2	**

DL 5% - 4.2; DL 1% - 7.1; DL 0.1% -10.6

Pomegranatefruits quality is shown in Figure 1.

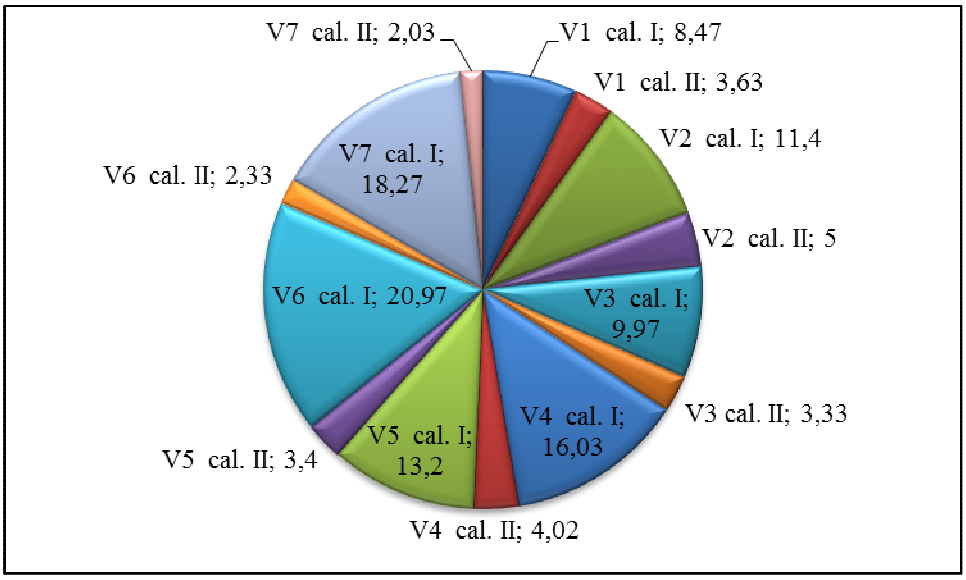

Fig.1. The percentage of first and second quality Punica fruits

The economic efficiency is favourable for all variants, but superior in the case of those fertilised with Foliar Feed 0.3%.

Table 4

Economic efficiency of the pomegranate crop

Variants	Fruit production t/ha	Production value lei/ha	Costs lei/ha	Profit
V_1- unfertilised crop (control sample)	12.1	72600	36800	35800
V_2- Foliar Feed 0.1% fertilisation every two weeks	16.4	101400	38300	63100
V_3- Foliar Feed 0.1% fertilisation once a month	13.3	81800	37900	43900
V_4- Foliar Feed 0.2% fertilisation every two weeks	20.1	128600	39700	88900
V_5- Foliar Feed 0.2% fertilisation once a month	16.6	102600	38100	64500
V_6- Foliar Feed 0.3% fertilisation every two weeks	23.3	151800	40200	111600
V_7- Foliar Feed 0.3% fertilisation once a month	20.3	129800	39400	90400

CONCLUSIONS

1. Pomegranate (Punicagranatum) planting in protected areas constitutes a profitable activity in the climate conditions of Sântandrei(Oradea, Bihor), but it is differentiated by crop technology.

2. Along with other external factors with strong effects on fecundation, flowering, fruit growth and quality, supplying plants with macro and microelements through foliar fertilisation has proven to be very important.

3. Pomegranate fruit production could double if foliar fertilisation is made alongside other technological methods, including pruning.

4. Increasing the number of days between fertilisations to up to a month and reducing the concentration of the Foliar Feed solution to 0.1% leads to a decrease in fruit production and fruit quality.

5. Although the percentage of flowers was almost equal between variants after the first and second physiological flower drop, it changed according to fertilisation.

6. The highest percentage of physiological fruit drop was observed in the control sample, while the lowest in variant 6.

7. Physiological fruit drop was lower in variants fertilised with Foliar Feed also thanks to its boron content.

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