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SUMMARY - In the last 2-3 decades we have introduced a lot of almond varieties from different climatic zones and we research them in different areas in Republic of Macedonia. We have noticed mass flower buds drop in the phase of swell (before the blossom) in some varieties whose origin is from warmer areas. It is a special characteristic for the varieties: Ferralise, Tuono x Ai (269 x 189), Cristomorto, Desmayo Larqueta, Ferraduel, Ferragnes, Tuono, Nonpareil and sometimes for the varieties Troito, Marcona, Tribucio, etc. This dropping of flower buds is not caused by the frosts because flower buds with completely healthy internal tissues dropped. This phenomenon is more marked in cooler areas, at higher altitude and with smaller sum of active temperatures in the vegetation. In this paper meteorological conditions in some areas in certain years are presented as well as their influences on flower buds drop in some almond varieties.

Key words: Almond varieties, flower bud drop, weather conditions.

RESUME - *"Chute des bourgeons floraux chez l'amandier". Lors des 2-3 dernières décennies, nous avons introduit un grand nombre de variétés d'amandier provenant de différentes régions climatiques et nous avons mené des recherches dans différentes zones de la République de Macédoine. Nous avons observé des chutes massives de bourgeons floraux pendant la phase de gonflement (avant la floraison) pour certaines variétés originaires de régions plus chaudes. Il s'agit d'une caractéristique spécifique de ces variétés : Ferralise, Tuono x Ai (269 x 189), Cristomorto, Desmayo Largueta, Ferraduel, Ferragnes, Tuono, Nonpareil et parfois pour les variétés Troito, Marcona, Tribucio, etc. Cette chute des bourgeons floraux n'est pas causée par les gelées car il y a eu chute de bourgeons floraux ayant des tissus internes totalement sains. Ce phénomène est plus marqué dans les zones plus froides, à plus haute altitude et avec une somme plus faible de températures actives pendant la période de végétation. Cet article présente les conditions météorologiques dans certaines zones lors de certaines années ainsi que leur influence sur la chute des bourgeons floraux pour quelques variétés d'amandier.*

Mots-clés : *Variétés d'amandier, chute des bourgeons floraux, conditions météorologiques.*

Introduction

In Republic of Macedonia almond is a traditional nut tree that is propagated with seeds and is cultivated as a separate trees. In the last 20-30 years we have introduced over 100 varieties of almond from different geographic and ecological regions- warmer or cooler than ours. We investigate them in many production regions with different climate and soil type. In this period in our country were planted and also observed and studied around 500 ha of commercial almond orchards with grafted trees of introduced and domestic varieties.

Our climate is moderate continental with frequent occurrence of strong winter and spring frosts that cause damages on almond. Damaged flower buds, flowers and small fruits fall in several waves (Ristevski 1987; Stilianides *et al.,* 1990; and others). Kester (1976) discovered bud-failure at some varieties of almond, especially when the summer is very hot. Massive dropping of flower buds and small fruits at some varieties of apricot was found by Gueriero and Bartolini (1991) in Italy, because of insufficient sum of low temperatures.

In 1990 and 1992 we have registered massive drop of swelling flower buds at some almond varieties. In those years we have not discovered freezing of buds on low temperatures but wholly healthy buds were dropping. The aim of our investigation was to find the causes and consequences of this phenomenon.

Material and methods

The studying was done in three experimental orchards: (i) in the Skopje Valley with altitude of 240 m; (ii) in the hilly region of Skopje with altitude of 600 m and north-east exposition and (iii) in the Kumanovo Region on altitude of 500 m, with little slope towards North.

The experimental orchards were planted in the Autumn of 1986. We observe over 70 almond varieties, but we present data only for 8 varieties. Table 1 shows data on flowering of these varieties. These 8 varieties were with biggest dropping of flower buds. We have observed the situation since 1990 until now, but we present the data only for 1990 and 1992 when dropping of flower buds was biggest.

Table 1. Beginning of flowering of almond varieties in Skopje, altitude 240 m

Varieties	1990	1991	1992	Average
1. Nonpareil	19.3	27.3	27.3	24.3
2. Desmayo Larqueta	20.3	25.3	26.3	24.3
3. Tuono	21.3	31.3	1.4	28.3
4. Tuono x Ai (x 189)	21.3	5.4	6.4	31.3
5. Cristomorto	21.3	5.4	7.4	1.4
6. Ferragnes	23.3	5.4	7.4	1.4
7. Ferraduel	24.3	6.4	7.4	2.4
8. Ferralise	24.3	7.4	8.4	3.4
Average	22.3	2.4	3.4	30.3

Results and discussion

Weather conditions

In the last 8 years we had three years (1989, 1991 and 1995) with more rain and low temperatures (Table 2). The rest five years were warmer and with long term drought. The dropping of flower buds in 1990 and 1992 was not with previous occurrence of strong frosts. At this time completely healthy swelling buds dropped.

Table 2. Main meteorological data for Skopje, altitude 240 m

Item	1989	1990	1991	1992
Average annual t (ºC)	12.0	13.0	11.7	13.0
Average vegetation t (May-September)	19.5	21.0	20.6	21.3
Annual sum of t (ºC)	4380	4745	4270	4758
Vegetation sum of t	2983	3213	3152	3259
Annual rainfall (mm)	585	286	537	354
Absolute minimum temperatures (ºC)				
Month	1989	1990	1991	1992
January	-13.1	-17.6	-10.0	-10.1
February	-7.8	-6.7	-19.1	-9.2
March	-1.5	-4.6	-4.6	-5.8
April	3.2	1.5	-1.9	-2.1
October	0.5	-5.1	-3.5	1.6
November	-10.4	-5.3	-4.8	-5.4
December	-13.1	-13.1	-10.5	-12.2

Flower buds drop

During March 1990 and 1992 in the phase of swelling we have determined massive dropping of completely healthy buds, without any signs of damages from frosts. From the observed 70 varieties the biggest dropping of flower buds (90-100%) was found at varieties: Nonpareil, Desmayo Largueta, Tuono x Ai (269 x 189), Cristomorto, Ferraduel and Ferralise (Table 3). Smaller dropping of flower buds (20-54%) was determined at varieties: Tuono and Ferragnes, and this dropping has not influenced the yields. Even lower dropping of flower buds (7-20%) was determined at varieties: Tetanyi Kemenheju, Marcona, Troito, Falsa Baresa, Fra Gulio Grande and Tributo, which does not reflect the yields as usual. At the rest of the varieties we have not found dropping of flower buds.

We will try to present some of our observations and comments about this phenomenon.

Table 3. Drop of swelling flower buds in 1990, in %

Varieties	1. Skopje (alt. 240 m)	2. Skopje (alt. 600 m)	3. Kumanovo (alt. 500 m)
1. Nonpareil	0	90	81
2. Desmayo Larqueta	90	96	92
3. Tuono	23	54	47
4. Tuono x Ai† (269 x 189)	99	100	-
5. Cristomorto	81	98	99
6. Ferragnes	0	43	16
7. Ferraduel†	38	91	-
8. Ferralise†	99	100	-
Average of 8 varieties	53.8	84.0	-
Average of 5 varieties	38.8	76.2	67.0

†These varieties are not planted in Kumanovo

Influence of the origin of the varieties

The dropping of flower buds is larger at the varieties that origin from warmer regions and smaller at the varieties that origin from cooler regions and domestic varieties of almond. It can be assumed that varieties that origin from hotter regions, even in mild winters, suffer some physiological disorders that afterward cause dropping of flower buds.

Altitude and heat regime

This conditions of the location have great impact over the dropping of flower buds at almond. Dropping of flower buds is lowest in the first orchard, average 38.8% (Table 3) which is on lowest altitude (240 m) and with best temperature regime. The dropping of flower buds is highest in the second location, 76.2%, which is on highest altitude, 600 m, and with lowest temperature and heat sum. The average annual temperature in the second location is lower for 1.4-1.5ºC, and in third location for 1-1.1ºC compared with first location. Also, similar proportion of dropping of flower buds was obtain in 1992 (Table 4). Between heat sum and dropping of flower buds we found negative correlation r= -0.367.

Also, on higher locations the vegetation period is shorter and flowering and maturing are later. This heat regime is not suitable for varieties that origin from hotter regions.

Meteorological conditions in previous year

The dropping of flower buds is also influenced by the heat regime and humidity from the previous year. Therefore, 1989 is characterized with lower average annual and vegetation temperatures and higher sum of rainfalls compared with 1990 (Table 2). In 1989 the flower buds were formed in more

humid conditions, so they are probably more sensitive to winter frosts that cause some physiological disorders and dropping of flower buds.

When in 1990 the flower buds were formed on higher temperatures, in 1991 we did not have dropping of flower buds in the phase of swelling. Similar dependence was obtained between 1991 and 1992.

Table 4. Drop of swelling flower buds in 1992, in %

Varieties	1. Skopje (alt. 240 m)	2. Skopje (alt. 600 m)	3. Kumanovo (alt. 500 m)
1. Nonpareil	0	12	0
2. Desmayo Larqueta	11	48	35
3. Tuono	0	17	15
4. Tuono x Ai† (269 x 189)	52	62	-
5. Cristomorto	40	71	57
6. Ferragnes	0	8	0
7. Ferraduel†	0	20	-
8. Ferralise†	43	77	-
Average of 8 varieties	18.2	39.4	-
Average of 5 varieties	10.2	31.2	21.4

†These varieties are not planted in Kumanovo

The dropping of flower buds, especially when it is between 80-90%, influence the reduction of yields. In 1990, when we had biggest dropping of flower buds, the average yields at the observed varieties were 0.57 kg nuts per tree or 363 kg per ha. In 1991 when the flower buds did not drop, the yields were twice higher (Table 5).

Table 5. Yield of kernels in Skopje, altitude 240 m

Varieties	1990 (kg per tree)	1991	1990 (kg per ha)†	1991
1. Nonpareil	bird damaged			
2. Desmayo Larqueta	0.20	0.81	126	512
3. Tuono	0.95	4.56	604	2896
4. Tuono x Ai (269 x 189)	0.14	0.13	89	82
5. Cristomorto	0.14	0.21	88	133
6. Ferragnes	1.68	0.65	1067	412
7. Ferraduel	0.89	0.72	566	458
8. Ferralise	0.00	0.14	0	90
Average	0.57	1.03	363	655

†635 trees per ha

Conclusion

The dropping of swelling flower buds at almond depends on several environmental and biological factors:

(i) From the heat regime of the location and the need of varieties for heat in certain phase of their annual life cycle.

(ii) It shows more frequently at the varieties that origin from warmer regions. At the domestic varieties and varieties that origin from cooler regions we have not determine dropping of flower buds.

(iii) Most sensitive on dropping of flower buds are varieties: Desmayo Larqueta, Tuono x Ai (269 x 189), Cristomorto and Farralise.

(iv) The dropping of flower buds is found more often on the locations with higher altitudes where heat sum is lower and the vegetation period is shorter.

(v) Between the heat sum and the dropping of flower buds we found negative correlation r= -0.367.

(vi) The dropping is more intensive if the previous year was cooler and more humid.

(vii) The dropping of flower buds, especially when it is over 80-90%, reduces the yields at almond.

References

Guerriero, R. and Bartolini, S. (1991). Main factors influencing cropping behaviour of some apricot cultivars in Coastal areas. *Acta Horiculturae,* 293: 229-243.

Kester, D.E. (1976). *Noninfections almond bud-failure.* Agr. Handbook No. 347, Washington, DC.

Ristevski, B. (1987). *Influence of the low temperatures on the almond cultivars in Macedonia*. Reus, Spain.

Stilianidis, D.C., Mouhtouri-Stilianidis, E., Loupassaki, M. and Isaakidis, A. (1990). Preliminary studies on almond fruit drops, causing factors and reducing measures. In: *8th GREMPA Meeting*, Nimes, France, pp. 157-175.