A study on acyl lipid content of leaves and fruits of olive oils during fruit ripening

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Abstract

The olive fruits are commercially valuable for their oil content or for their edible flesh. The oil is a source of energy and a basic nutrient that supply esential fatty acids, vitamins and antioxidant.

We studied qualitative and a quantitative changes of olive leaves and olive fruits lipids during fruitripening in Manzallino and Dezful cv.s grown in Dezful, Khouzestan.

During ripening of fruits, we measured total lipids and analysed fatty acids by Gas chromatography in on and off years.

The results show that; important fatty acids of leaves and fruits are oleic acid, palmitic acid and linoleic acid. Although total lipids and fatty acids increase during ripening but a negative association exist between percent of palmitic and oleic acids of leaves and fruits.

Leaves show an increasing in percent of palmitic acid but a decreasing in percent of oleic acid during fruit ripening, and fruits show an increasing in percent of oleic acid but a decreasing in percent of palmitic acid during fruit ripening.

Dezful cv. Although is smaller than Manzallino cv. But its lipid amount is more than Manzallino cv. With equal oleic acid, then propose for culture in this area.

Comparisons of these results with our previous results on some cv.s from Guilan, show that climate doesn ,t have important effect on lipid acumulative and alternate bearing.

Introduction

Olea europapaea L is one of the most important and widespread crops of the Mediterranian basin ,which has longevity and adaptation to climatic conditions ,also the olive fruits, are commercially valuable for oil content or for edible flesh .

The biochemichal process of oil accumulation in the olive fruit and the precursors for its synthesis during of fruit maturation has received considerable attention in recent years . Leaves are always important as a precursors for oil synthesis . For identification of this relation we had studied lipid component of leave and fruit in two successive two years. Due to the fact of alternate bearing exist in olive and reduces speed of transferring in off year, one reason of this can be decreasing of un saturated fatty acid that cause reduces rate of fluidity of membrane.

leaves and fruits fatty acid, also studied changes process of them during fruit ripening in two cv.s Manzanillo & Dezful cultivated in Khoozestan in Iran. As far as we know this investigation was performed for the first time.

During fruit ripening, total lipids of leaves & fruits was determined and amount of fatty acid was measured with Gas chromatography. This observation was performed on two cv.s for two successive years (on-year & off year).

Materials & Methods

Leaf and fruit samples from tree, Manzanillo & Dezfull cv.s grown in Khoozestan, Iran, were prepared during fruit ripening at 3 month intervals from 75 to 165 days after fruit set, from region of Safi abad garden of Dezfull in Khoozestan province at 2001 & 2002 years. The samples were lyophilized for 48 hr, powderded in omnimixer and maintained at -20 oC (6).

Average weight of olive fruit was determined by weighing. For flesh sepration, fruit were cut in half horizontally with a stainless-steel knife and stones were removed and weighed (9). The flesh content was calculated by subtracting the stone weight from the whole olive fruit weight. The flesh to stone weight ratio (F/S) was determined by dividing the flesh weight by the stone weight .

Materials & Methods

Oil content was extracted by mixture consisting of chloroform-methanol (2:1 v/v). Oil content of leaves released by saponization because most of leave lipid are structural (8).

After derivation of lipids by methanolic Hcl (1.5 M), gas chromatography (GC) of derivation was performed on shimadzu GC apparatus (model 17A). 1µl samples was injection in to a GC with flame ionization detector for analysis.

A 50% phenyl – polysilphenylene-siloxane capillary column was used under the following program condition, temperature of column 150 oC for 5 min, 180 oC for 26 min. Detector and injection 250 oC

and 200 oC respectively. Carrier gas was N2 with a flow rate of 50 bar (10).

Result and Discussion

Our results shows the weight of fruits that in two cv.s increased in two years. We emphasize that weight of Dezful fruit, that is a native cv, was less than non native cv (Manzanillo) because of differences between cv.s,also irrigation has role in fruit growth and crop enhancement (4) . Also weight of fruits in off-year was more than on-year. Total lipid of fruit increased for two cv.s during ripening but in last during ripening afterward decreased. It was relation to pigment constitution. Its reason is a little of precursors lipid biosynthesis was used for pigment constitution such similar observation have previously been reported.

Not only native cv (Dezful) had little fruits but also had more than amounts of lipid from the other cv.

Result and Discussion

Amounts of total lipid were different and for any cv is special in two year . In off year number of fruit was decreased. In leaves, total lipid in off-year was more than that on-year because of the consumption of its food resources during the previous year, it begins to restore the loosen storages (3,5) . Maximum amount of oil have observed after 165 day after fruit set.

Basic fatty acids in leaves and fruit were palmitic acid, oleic acid and linoleic acid (Fig 1-8). Amount of oleic acid in fruit in two cv.s increased during ripening and amount of palmitic decreased (7).

Fruit is the storage place for oleic acid and a negative correlation was found between palmitic and oleic acid in fruit that show in Fig 9-12, since oleic acid prepare palmitic acid (9).

Result and Discussion

In off-year amount of palmitic acid was more than that in on-year (6).

To be consider that increasing the percentage of unsaturated fatty acid will cause the increasing fluidity of membrane and the membrane permeability will increase too (6,9).

As a result the destroying and senescence process will happen. Acording to the reports about tomato , apple, peach and the changes wich observed in the fatty acids of mesocarps in olive, we can confirm this theory that lipids has on important role in the ripness process (1,2).

Result and Discussion

In leave ,saturated fatty acid increased during ripening and unsaturated fatty acid decreased, this model has better arrangement about oleic acid. Linoleic acid sometimes increased during ripening (8).

These changes might be because of the lipid peroxidation which is in alive system, we know that they prefere to destroy fatty acids which double bounds, and this is the fact that will cause increasing the ratio of the saturated fatty acids to the unsaturated fatty acids (9).

Because of the increasing of unsaturated fatty acids will cause the fluidity of membrane and also during the ripeness of fruits the need of transportation will increase, that is why the increasing of unsaturated lipids will be justified.

(year 2001=off year=1، year 2002 = on-year=2)

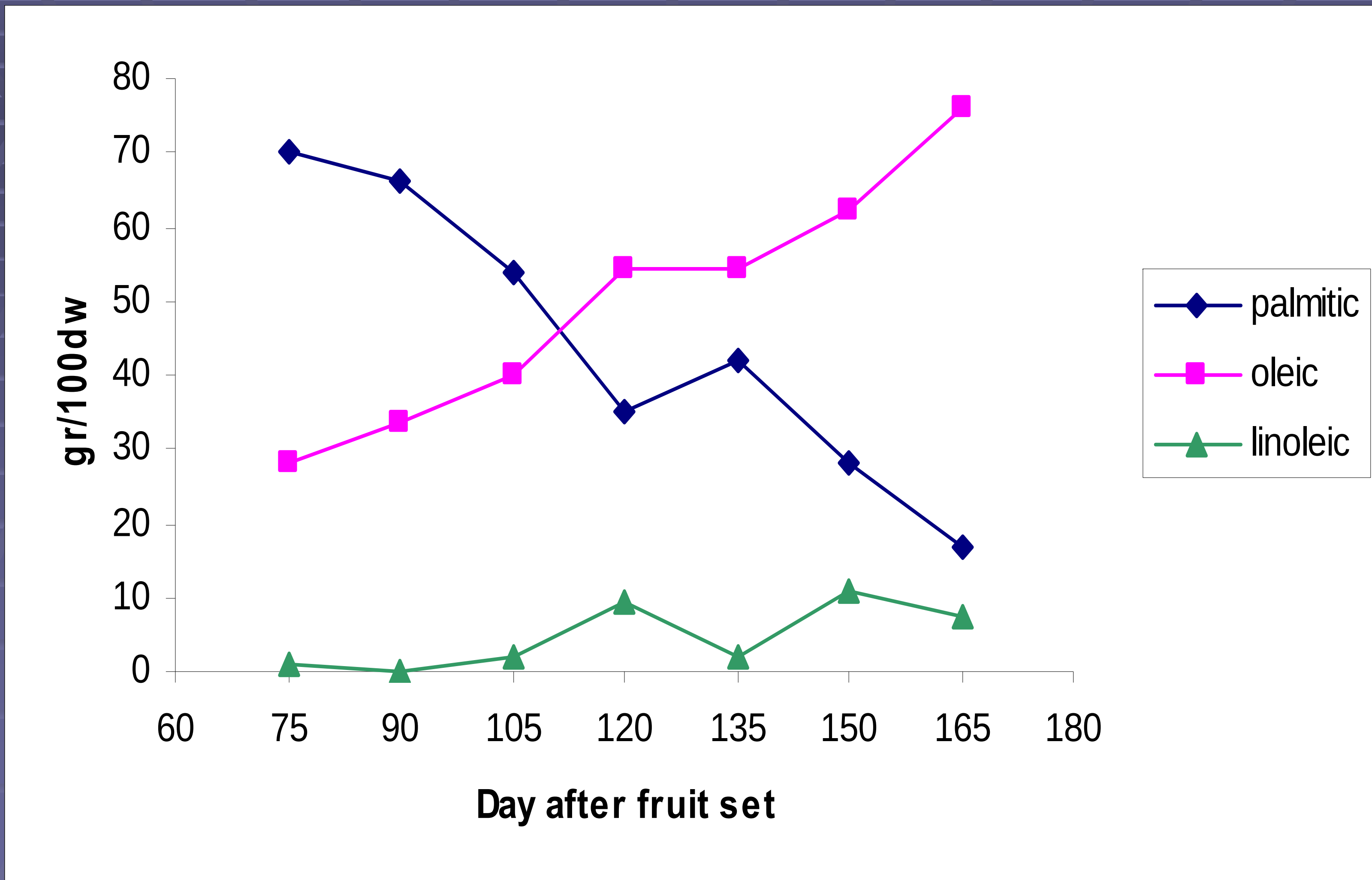
Table 1: changes of fruit weighting

Day after fruit set	Weight of 1000 grain(gr)		Weight of Flesh(gr)		Weight of Stone(gr)		Flesh to Stone Ratio	
75(1)	3900	2800	3080	2150	820	650	3.75	3.31
75(2)	3250	2180	2515	1631	735	549	3.4	2.9
90(1)	4500	3250	35550	2750	950	680	3.74	3.8
90(2)	3500	2490	2750	1886	750	604	3.66	3.12
105(1)	4950	3500	3990	2770	960	730	4.2	3.8
105(2)	3820	2701	3060	2035	760	666	4.3	3.1
120(1)	5340	4100	4390	3320	950	780	4.62	4.26
120(2)	4243	3500	3458	2750	785	750	4.41	3.7
135(1)	5800	4500	4830	3680	970	820	4.9	4.5
135(2)	4799	4230	4009	3465	790	765	5.1	4.52
150(1)	6150	4850	5170	4020	980	830	5.3	4.84
150(2)	5280	4300	4460	3520	820	780	5.44	4.51
165(1)	6640	5300	5660	4450	980	850	5.7	5.24
165(2)	5620	4600	4760	3815	860	785	5.53	4.86

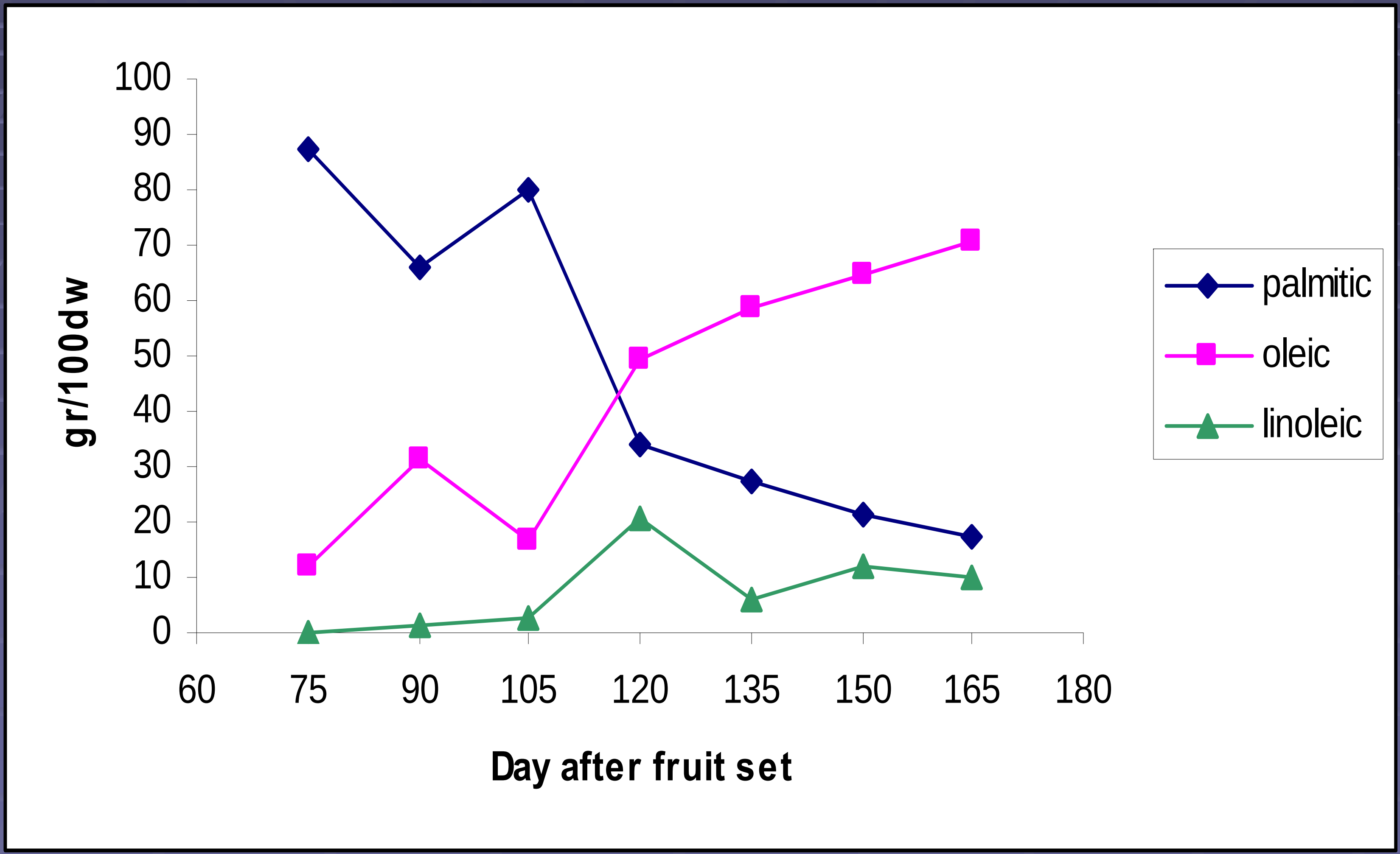
Table2: Total Oil of Leave and Fruit

Day after fruit set	Manzanillo		Dezful	
	Leave	Fruit	Leave	Fruit
75(1)	6.4	3.8	7	4.3
75(2)	3.5	3.9	4	4.6
90(1)	6.9	4	7.8	4.4
90(2)	3.8	4	4.5	4.7
105(1)	7	4.5	8.2	5
105(2)	4.2	4.8	4.8	5.4
120(1)	7.3	5	8.4	5.9
120(2)	4.3	5.6	5.1	6.3
135(1)	8.2	7.9	8.5	8.9
135(2)	5.3	8.1	5.3	9.5
150(1)	8.9	7.2	9	8.3
150(2)	5.8	7.5	5.8	8.8
165(1)	9.3	8.3	9.5	9.1
165(2)	6.2	8.5	6.3	9.3

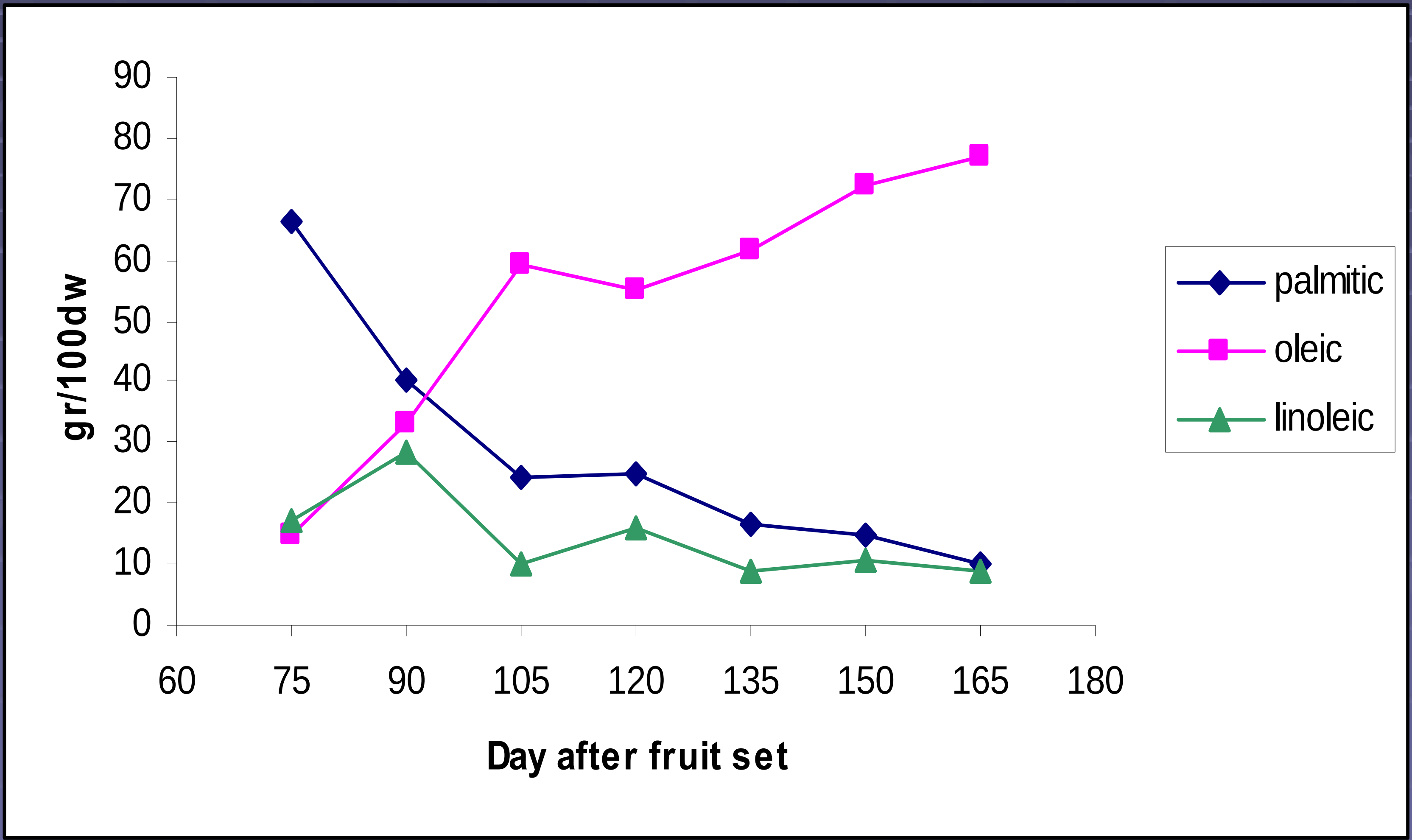
1-Percent of Manzanilo fruit fatty acid (year 2001)



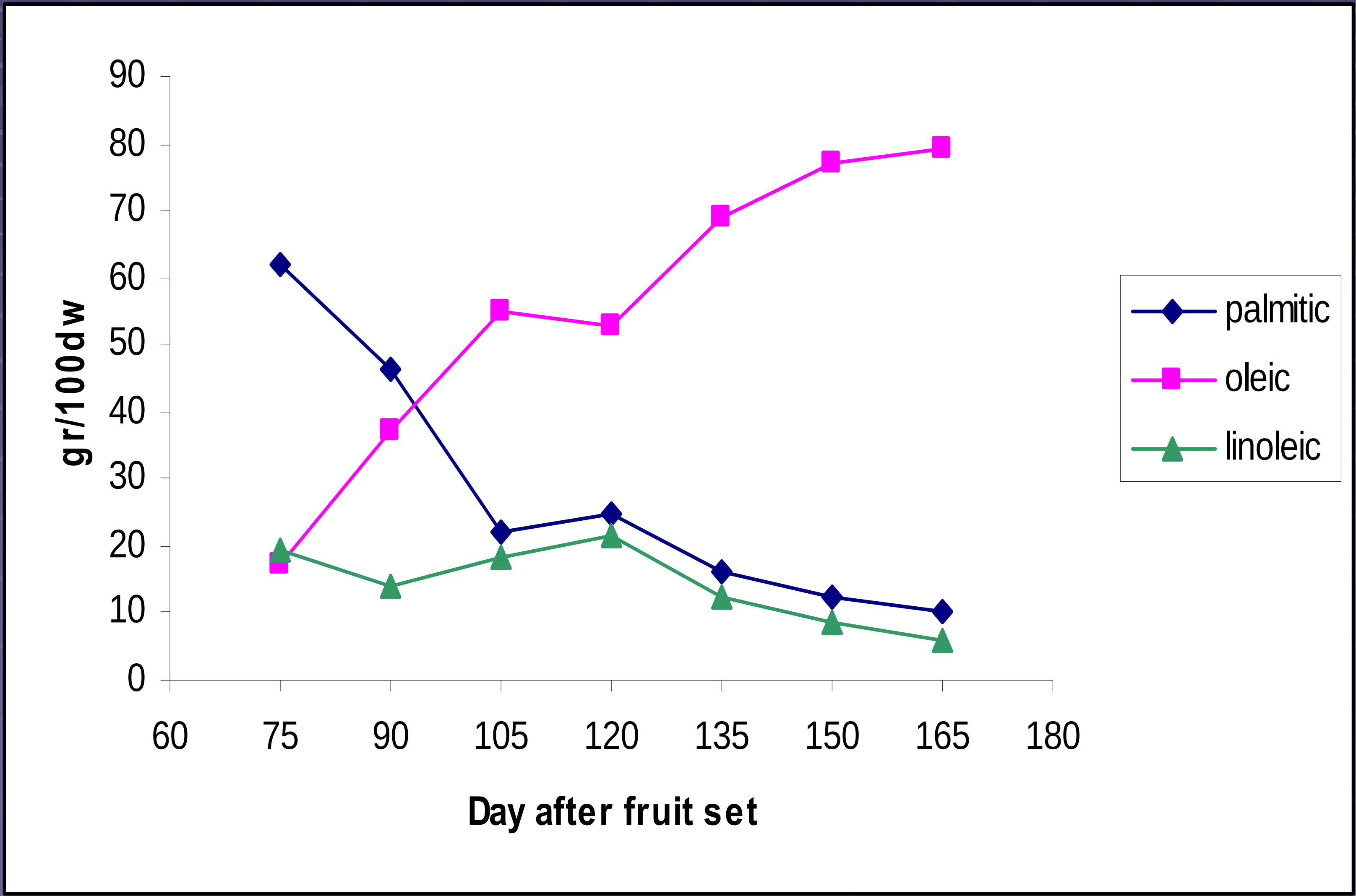
2-Percent of Dezful fruit fatty acid (year 2001)



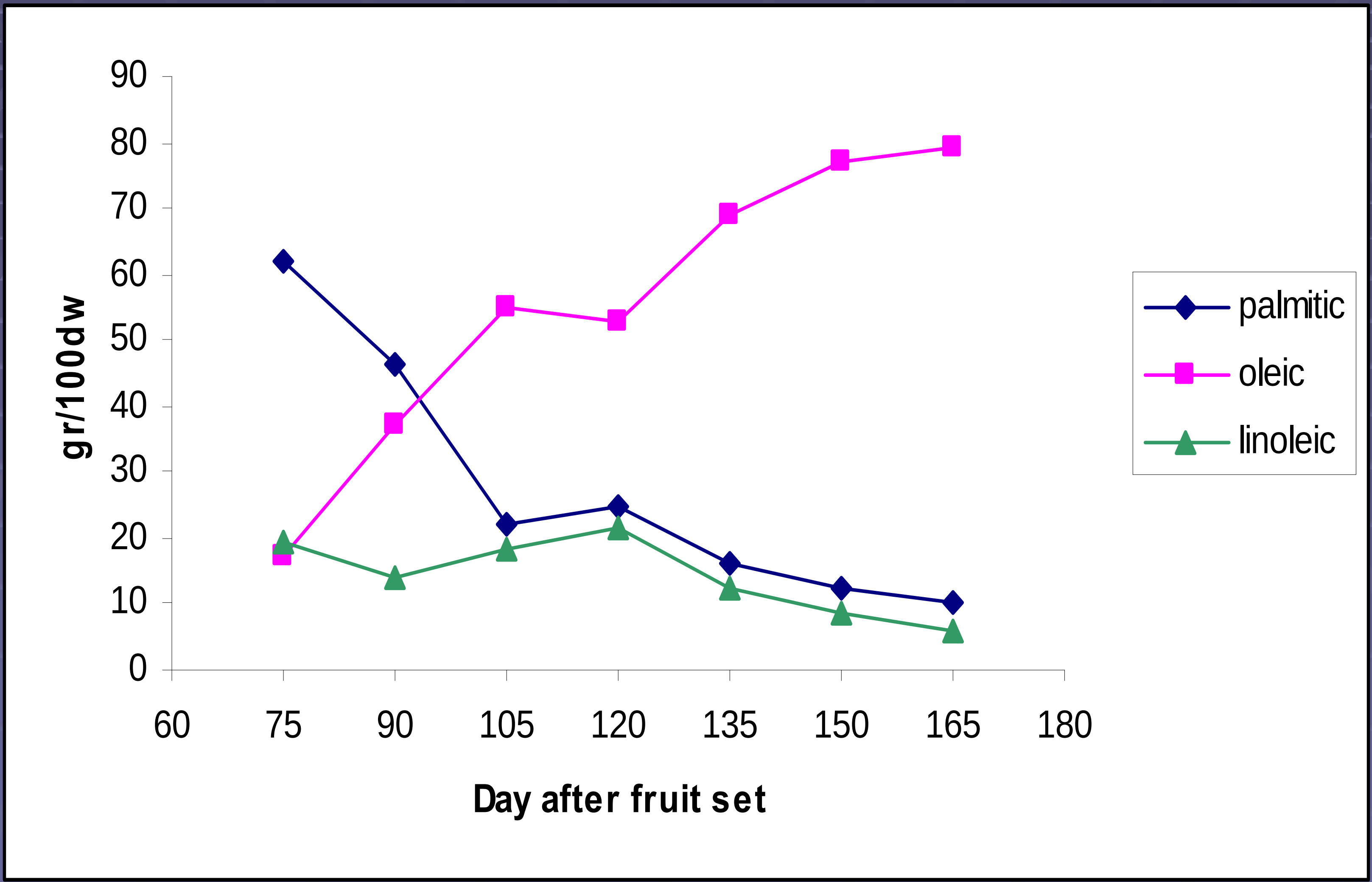
3- Percent of Manzanilo fruit fatty acid (year 2002)



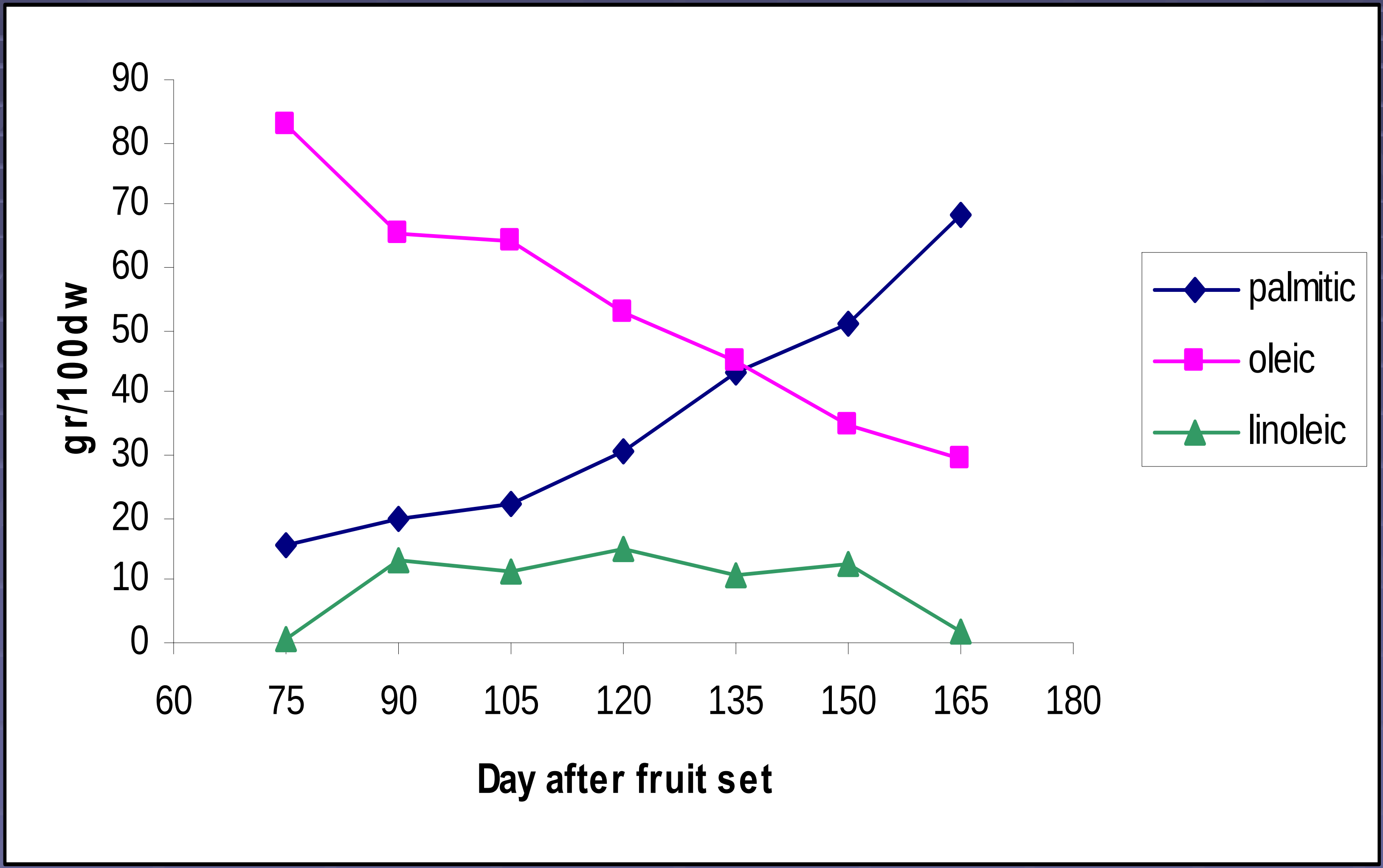
4-Percent of Dezful fruit fatty acid (year 2002)



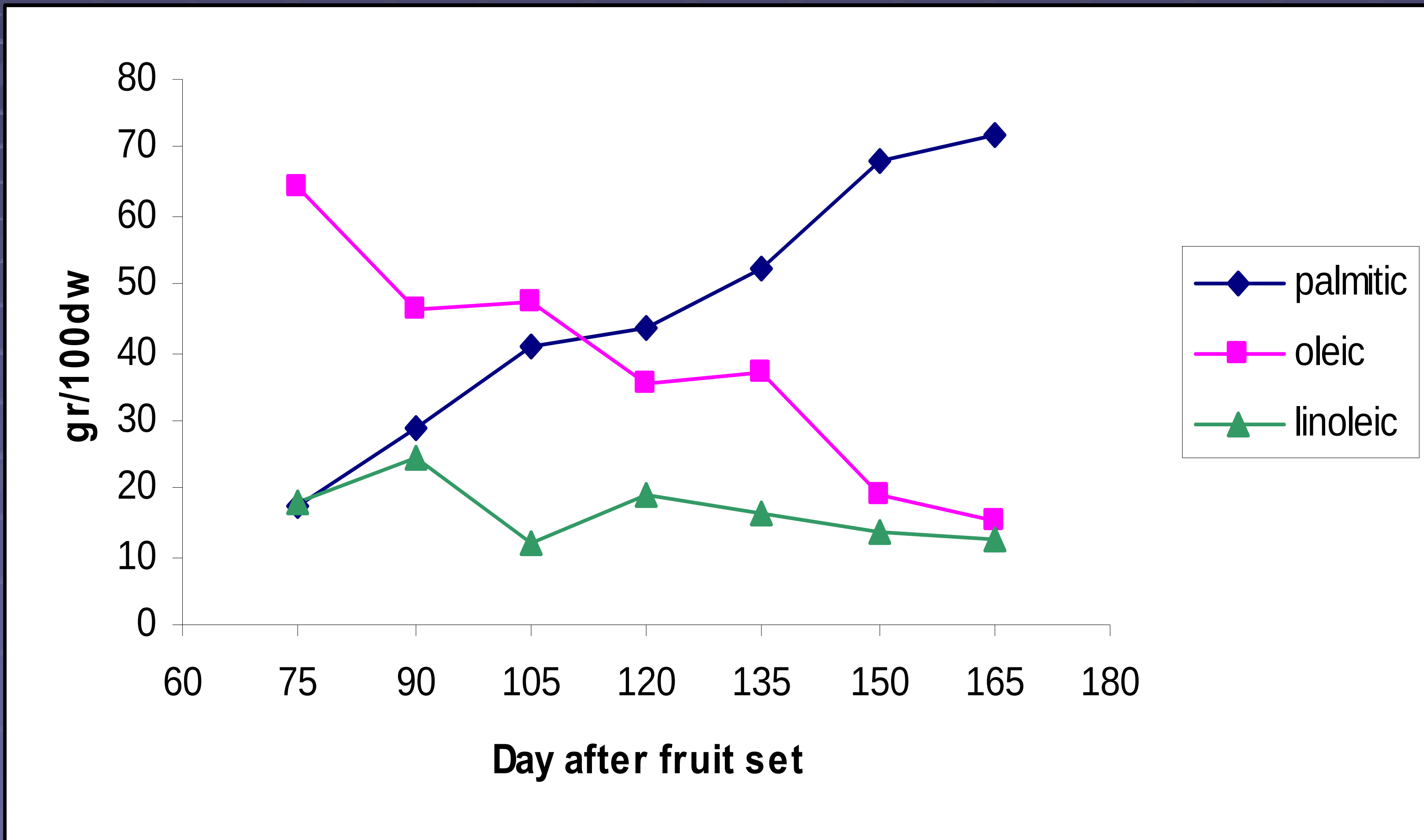
4-Percent of Dezful fruit fatty acid (year 2002)



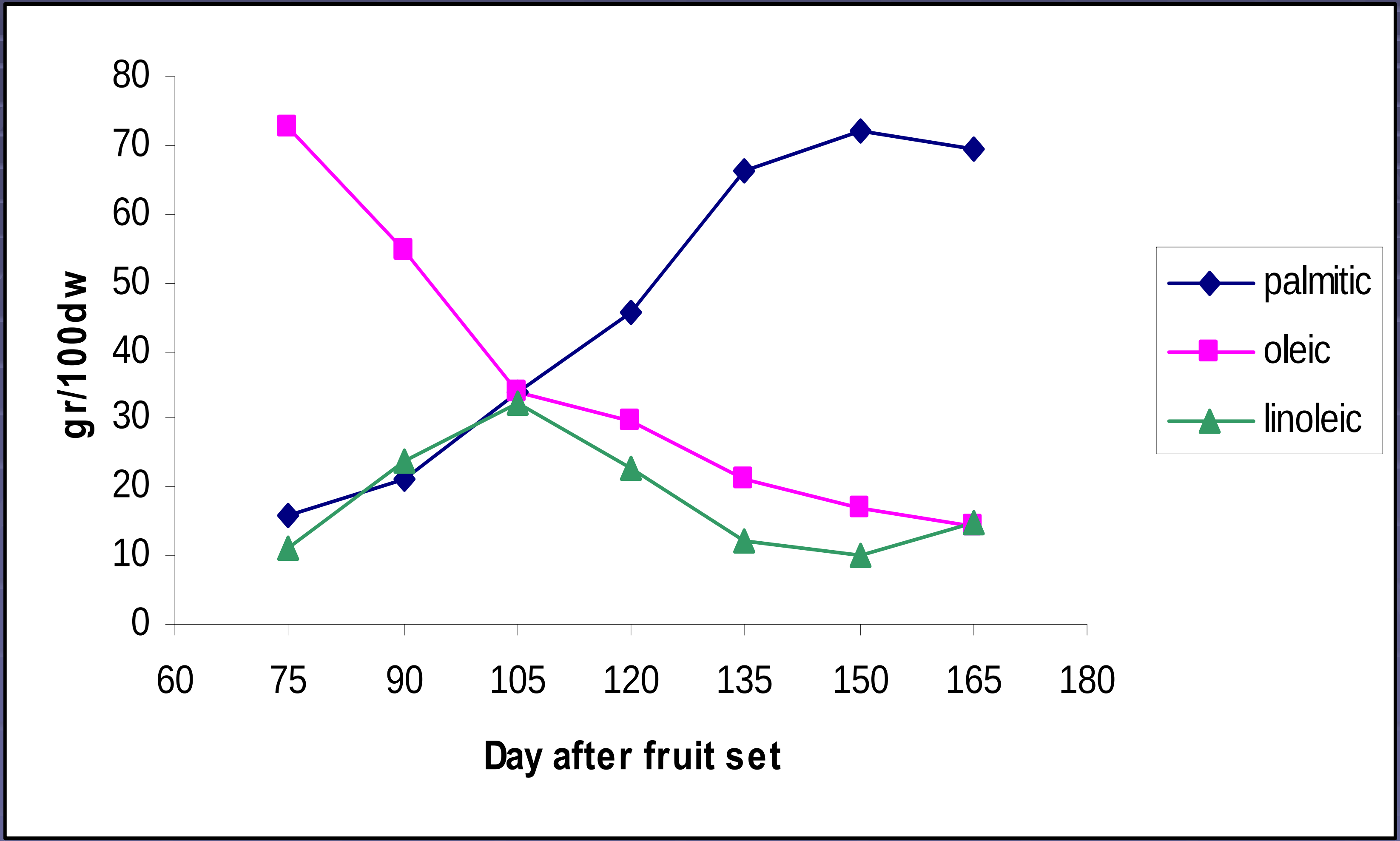
5-Percent of Dezful leave fatty acid (year 2001)



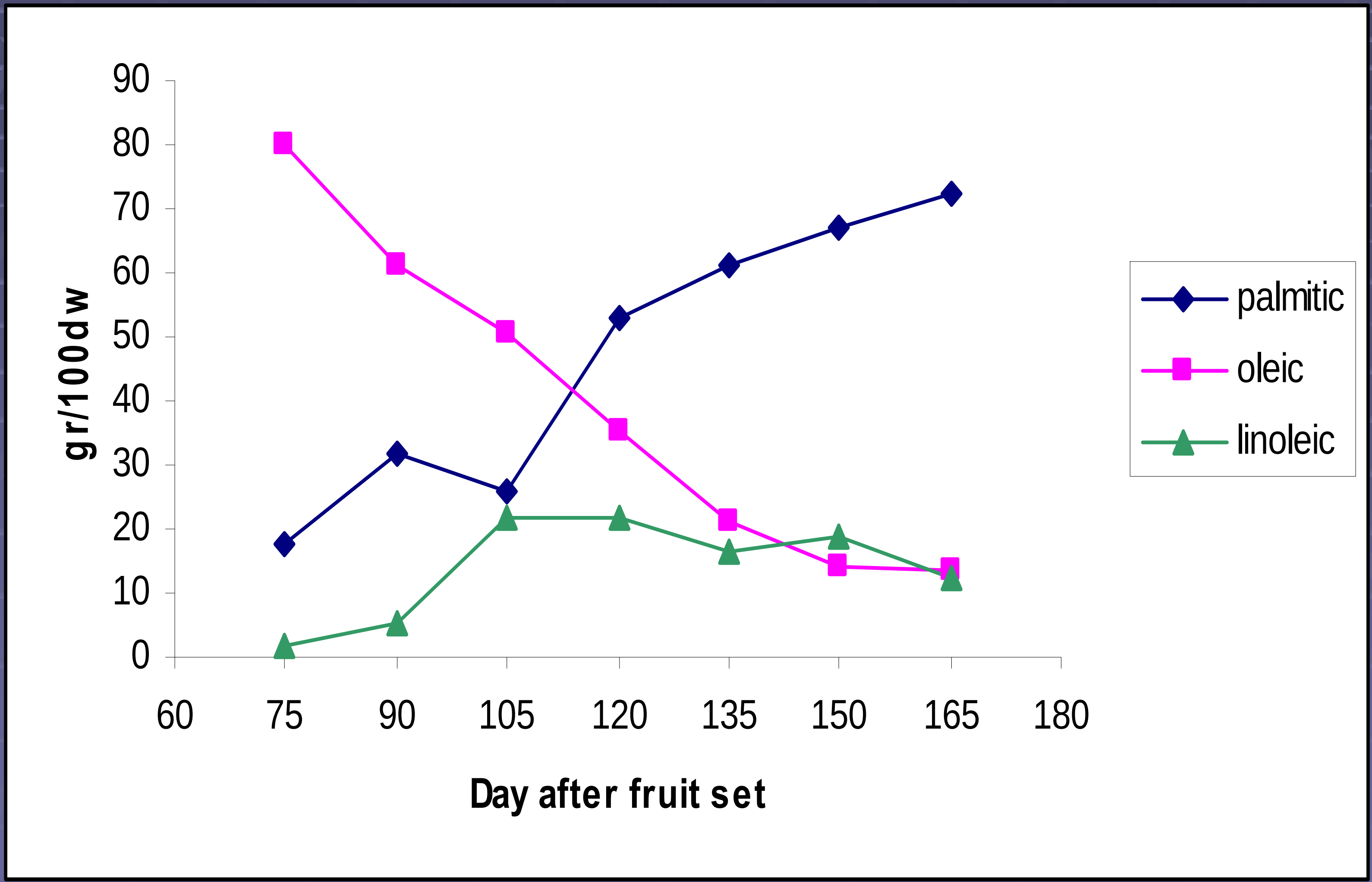
6-Percent of Manzanilo leave fatty acid (year 2001)



7-Percent of Dezful leave fatty acid (year 2002)

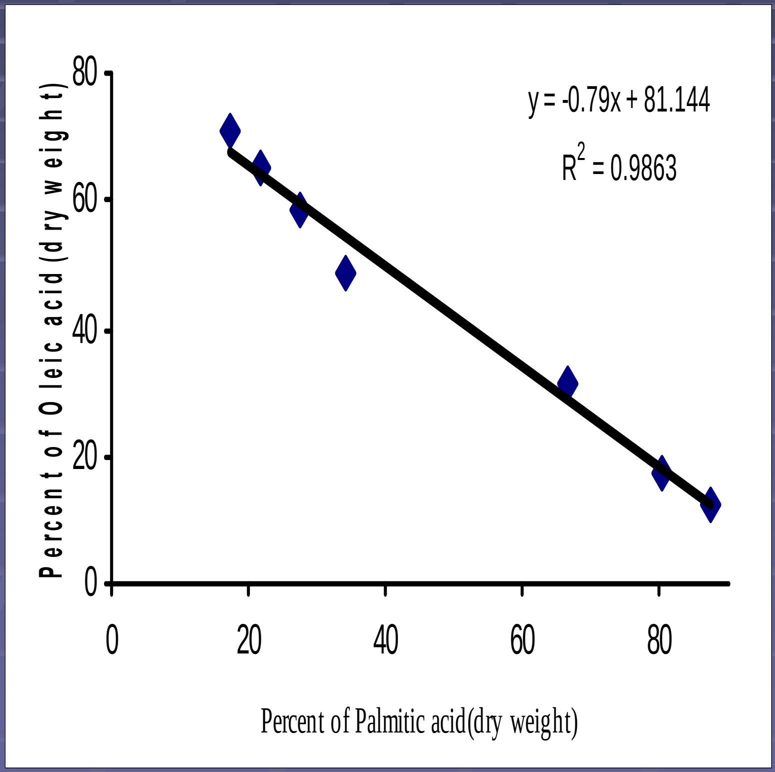


8- Percent of Manzanillo leave fatty acid (year 2002)

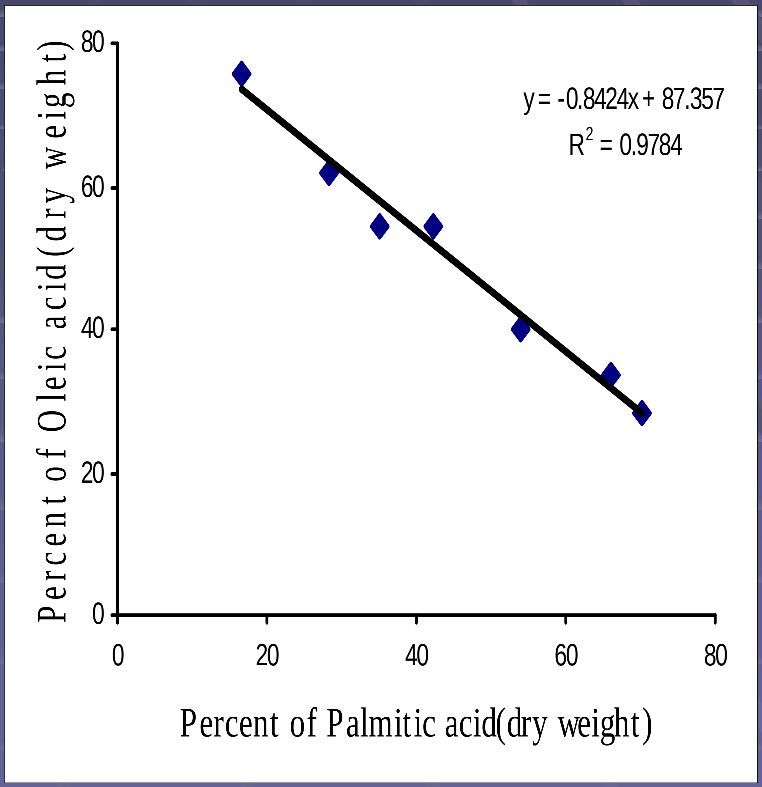


9 Negative correlation between palmitic and oleic acid of fruit 10 Negative correlation between palmitic and oleic acid of fruit

(Dezful year 2001)



(Manzanillo year 2001)



acid of fruit 11 Negative correlation between palmitic and oleic acid of fruit 12 Negative correlation between palmitic and oleic

(Dezful year 2002) **(Manzanillo year 2002)**