

## RESEARCH ARTICLE

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**Effect of prohexadione-calcium(Regalis) on shoot growth in Pear var. Passe Crassane**MAXHUN SHEHAJ<sup>1</sup>, PETRIT RAMA<sup>2</sup>, BARI HODAJ<sup>2</sup><sup>1</sup>CNV, Kosaova<sup>2</sup>Agricultural University of Tirana, Albania**Abstract**

Prohexadione-calcium (Regalis) is a shoot growth retardant that inhibits gibberellins biosynthesis. The aim of this study was to evaluate the efficacy of applying Regalis by foliar applications in *Passe Crassane* pear orchards to reduce tree vigor or shoot growth, to improve the structure of the canopy, to accelerate the earliness of fruit bearing and to control the alternate fruit production. Three different dosages were tested: 50ppm, 100ppm, 150ppm. Regalis treatments ranging from 50 to 150 ppm were compared with control, without treatments. The first treatment was applied 7 days after petal fall and the others every 10 days after the first treatment. The data was collected at the end of the vegetation period on 10 October. The growth vigor of the shoots and the shoot length of node was significantly different after the treatment of 150 ppm than the application of 100ppm and 50ppm. The mean number of nodes per shoot percentage was not significantly different between different treatments (50ppm, 100ppm and 150ppm). The length of the shoots for non-treated trees was higher than for treated ones.

**Key words:** prohexadione-Ca, Regalis, Growth retardant. *Passe Crassane*

**1. Introduction**

Several techniques have been employed to avoid excessive shoot growth as different types of dwarfing rootstocks, dormant and summer pruning, root pruning, root restriction, stem girdling or sawing, limb bending, breaking or wounding and restrictive fertilization and irrigation. However, any of these methods is cost-intensive and bears a high risk of failure. Furthermore, part of trees assimilate are lost.

Alternatively or additionally, plant regulator may be employed for the reduction of shoot growth (7)

Plant growth regulators that inhibit the development and growth of shoots have been used to reduce the amount of shoot growth and subsequently increase yield. Plant growth regulators modify growth and development in various ways. They can be well integrated into orchard production systems. Gibberellin biosynthesis inhibitors have one key role in cell elongation (5,8). The most used growth retardant is the Prohexadione-calcium (Regalis) that has low toxicity and persistence in the plant.)

The inhibitory effect of Prohexadione-calcium (Regalis) leads to the formation of growth-active gibberellin (8) leads to a reduction of longitudinal shoot growth

There are a number of applications of plant hormones in agriculture, horticulture, and

biotechnology. Trials with Prohexadione-calcium to control vegetative growth of apple, pear and plum trees were demonstrated by other authors (1,8). Prohexadione-calcium is a new generation gibberellins biosynthesis inhibitor that has low toxicity and persistence in the plant.

The objective of this research was to quantify the efficacy of Prohexadione-calcium (Regalis) at three different concentrations, on three treatment times, on pear cultivar *Passe Crassane*.

**2. Materials and Methods**

Investigations of (Prohexadione-calcium (Regalis) effect on pear tree var. *Passe Crassane* were carried out at the region of Peja, municipality of Kline, Republic of Kosovo. The orchard was planted in the spring of 2009. Planting distance was 3x1,5m. Trees were trained as slender spindle. A randomized complete block with four replications, four treatments and two trees per experimental unit was used as the experimental design.

Regalis ranging of treatments were as follows:

1. Control without treatment
2. Treatment with 50ppm (a.s) Regalis
3. Treatment with 100ppm (a.s) Regalis
4. Treatment with 150ppm (a.s) Regalis

The first treatment was applied 7 days after the petal fall

The second 10 days after the first treatment

The third 10 days after the second treatment

The length of shoots, the number of the nodes, the length of internodes and number of leaves of new growth (current growing season) on 15 randomly selected extension shoots (selected randomly on each tree) was measured at end of growing season, on 10 October. Differences between means of each treatment were analyzed by the Duncan multiple range test ( $P < 0.05$ ).

### 3- Results and Discussion

Vegetative growth is the parameter most obviously affected by (Prohexadione-calcium (Regalis) applications. The inhibitory effect of the (Prohexadione-calcium (Regalis) formation of growth-active gibberellin (8) leads to a reduction of longitudinal shoot growth.

As a general result, a successful use of (Prohexadione-calcium (Regalis) in pear was more difficult to achieve than in apple (3,4)

Table 1 summarises the results of several experiments with 'Passe Crassane' the widespread pear cultivar in Kosova, in which the effects of different dosages of application had been evaluated. Final shoot length was generally reduced by treatments by approximately 14.5% to 22% as compared to untreated trees. The length of the shoots was not significantly different between 50ppm and 100ppm. Our results that the successful use of Regalis in pear was difficult to achieve have been confirmed by other researchers (3). The treatment of the pome with Regalis both a single application of 250 g ha<sup>-1</sup> (a.s.) or a split treatment with 2 x 125 g ha<sup>-1</sup> (a.s.) led to an average reduction of shoot growth by approximately 40% (9)

**Table 1.** Effect of Prohexadione –calcium (Regalis) on length of shoot

Treatments	r1	r2	r3	r4	Means
V0(control)	27,536	26,370	27,240	31,545	28,4228c *+
V1	25,818	22,870	23,080	24,042	23,9525a
V2	23,857	26,556	19,500	26,053	23,7415a
V3	24,233	21,500	18,667	21,183	21,3956 b
Means	24,61109	24,07387	21,62167	25,70559	96,01222

\* Separation by Duncan's multiple range tests, at  $P < 0.05$  (+Mean of four replications)

$F = 5,567772$ ,  $F_{ref} = 3,490295$

Table 2 shows that number of nodes was not significantly different between non-treated trees and treated trees, while the increase in shoot length in absolute terms was different between treatments. This

means that the treatment with Regalis inhibits growth of the shoots but did not prevent the formation of the buds. For this reason the average number of the buds is equal in treated trees with Prohexadione-calcium and untreated ones.

**Table 2.** The mean number of internodes per shoot

Treatments	r1	r2	r3	r4	Means
V0(control)	7,010	8,507	8,513	8,013	7,898
V1	7,594	7,290	7,360	6,869	7,278
V2	7,455	8,047	6,167	8,684	7,588
V3	8,078	7,414	6,667	7,845	7,501
Means	7,534	7,814	7,176	8,103	30,628

**Table 3.** The mean length of internodes(cm)

Treatments	r1	r2	r3	r4	Means
V0	3,5	3,1	3,2	3,5	3,970a*+
V1	3,4	3	3	3,5	3,225b
V2	3,2	3,3	3	3	3,125 b
V3	3	2,9	2,8	2,7	2,850 b
Means	3,275	3,075	3	3,175	12,525

\* Separation by Duncan's multiple range tests, at  $P < 0.05$  (+Mean of four replications)

F= 0,707664. F ref= 3,490295

Evaluation of the data of Table 1 with Table 3 shows that the increase of the shoot length is proportional to the increase of internodes length. This means that the buds formed on the trees treated with Regalis have less competition from the apical dominance of the growing shoot. Consequently, the possibility of their differentiation in flowering must be greater. This has been confirmed by other authors. Excessive vigor could be considered to competitively inhibit flowering through hormonal control (6)

F=4, 436464 F ref =3.490295

As can be seen in Tab.4 the numbers of the leaves were almost equal in all the treated and untreated trees.

Analyzing Tables 1 2 3 and 4 found that the effect of Regalis was not significantly in the number of nodes and consequently in the number of buds and in the number of leaves. This confirms that only shoot growth and internodes length may be controlled by Regalis application.

**Table4.** The mean number of leaves per shoot

Treatment s	r1	r2	r3	r4	Means
V0	15,699	16,564	15,995	20,991	17,3121
V1	17,870	18,412	16,102	16,999	17,3458
V2	15,975	19,351	12,624	18,907	16,7142
V3	16,611	16,574	15,475	17,386	16,5113
Means	16,539	17,725	14,799	18,821	67,8835

F= 0,163039. F ref= 3,490295

So, the use of Regalis reduces the apical dominance of the growth of the shoots and may be promotes the differentiation of flowers on the lateral buds

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