Evaluation on Some Treatments After Spring Frost Damage in Inflorescence Bud Formation in Pistachio Orchard

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Abstract:

(In the 3rd of April 2008) and in the morning of (16 April 2008), the temperature reached - 6 °C in some pistachio gardens of Kerman County especially in Sirjan. The coldness was so high that affected not only on the open flowers but also on bud endings and lop growth, So that the next year product was endangered, as well.

In order to study the effect of some treatments and decrease the damage, some experiments were done in the form of split. Split was tested in the form of random block model so that original plot included irrigation treatments and nitrogen fertilizer was on 30 days after the cold happening , and secondary plot included prune treatments : in three levels, 1. Without prune, 2. Elimination of 30% of grown branches, 3. Elimination of 60% of grown branches.

Allendance with pbz in three levels: 1. control, 2. 4 PPM Pbz, 3. 8 PPM Pbz with density. For every treatment, four repetitions were done, and the percentage of bud formation was measured. Results showed that although the irrigation after happening of coldness has stimulated the growth but it wasn't any influence on the next year product.

Also it was defined that the mutual effect between irrigation and nitrogen fertilizer increased the formation of bud. The combination of irrigation, nitrogen fertilizer and 30% treatment caused the maximum of flower formation, and pbz increased the flower formation as well. According to results, it is said that 30% treatment could improve the problems of coldness.

Keywords: pistachio, Pbz, low temperature stress, flower bud, prune, nitrogen, irrigation.

Introduction

In the morning of (16 April 2008), the temperature reached -6 °C in some pistachio gardens of Kerman County especially in Sirjan. The coldness was so high that affected not only on the open flowers but also on end buds and lop growth. So that the next year product was endangered, as well. Resistance against coldness during winter and the beginning of spring is changeable and is affected by some

parameters (Ferguson, *et al.*, 1991). Cold stress lead to low pollen producing and resulted low fruit set. Low temperature can changed flower shape and finally lead to flower sterility and fruit deformation (Liang *et al.*, 1994; Ito *et al.*, 2002). Before the resistance increases to a low temperature, the active development should be stopped (Yoshida, 1984).

The bigger tissues such as trunk and canopy organs remain warmer than around environmental few hours after frost injury (Ashworth *et al.*, 1985).

The resistance perishing usually occurs more quickly than resistance (Proebsting, 1978).

Flower tissues have different resistance in different stages of growth (Liang *et al.*, 1994).

One of the main aims of pruning of fruitful pistachio trees is the limitation of tree sizes, and the improvement of light infiltration into the fructiferous branches and the producing fruit in the tree crest (Crane J *et al*, 1980).

A research was done in the pruned trees but there wasn't any reaction in the old trees (Quamme, 1978).

Pbz has been the preventer of growth and decreased the environmental stress in the trees. In a study, the influence of pbz on the deduction of coldness stress in tomatoes twigs and keeping them in safe have been reviewed in this stage.

The results showed that the coldness stress increased the amount of proxidation in membrane and prolin in the twigs (Jafari *et al.*, 1385). In this research, some care effects after happening of coldness, the decreasing of damages and the influence of cares on the flower buds were studied.

Temperature falling at the beginning of spring specially when it happens with the buds and flowers opening, it causes significant damages. Most of the tropical trees exposed to damages of freezing in the winter and in the beginning of spring coldness.

Frost–biting happens when the temperature reaches below $15^{\circ}C$ and causes some damages. (Wilson, 1996).

The sensitiveness of plant issues to the cold weather is different. The leaves have a little compatibility. The roots have less resistance than the stem which passed the cold weather. (Weiser, 1979).

In the autumn months, the skin resistance and wooden vessels are almost the same, but in the winter the skin has little chance to survive. (Westwood, 1978).

The resistance against cold weather during winter and beginning of spring is changeable and is influenced by some parameters (Quamme, 1978).

When the issues are growing, they show less reaction to the cold weather. That is when the buds are sleeping, they show less reaction. When the buds are in flamed, the resistance falls and reaches the least degree in open flowers.

Pistachio trees showed a high predominance of growing in ending part. It means that the strong and fast-growing branches of current year are made from the nearest one–year ending buds. Growing buds are mostly produced in spurs of lower branches, upper branches, fast–growing branches

and slaw–growing branches. Hormone controlling in ending part of bud causes this phenomenon. This phenomenon causes that the fructiferous point keeps aloof from the central part of the tree.

Primary study of prune showed that predominance of older tress can be reduced by completing in the tree crest. (Crane and Wakiri, 1980). This action produces the new branches on fourteen to seventeen years old branches.

Another study had done on the pruned trees but there was no sign of youthfulness in old trees.

In pistachio tress, the diameter of the branches increases slowly. This action causes the branches which have less fruit grow vertically and bend a lot during producing. In almond, a dried fruit with out ending predominance, the fast – growing side and vertical branches are generated from the bending part of the main branches. (Fergosen *et al.*, 1991). However, the ending predominance of pistachio causes the compression of branches, leaves, tree deformation, and formation of flower bubs on the branches because of light shortage.

Conditioned decrease of growth in a part of tree crest causes the growth improvement in the upper part of the tree where there is no limited light.

The increasing of the tree height in the upper part of the fructiferous trees makes the workers cannot prune them. Thus, one the main aims of pruning the fruitful pistachio trees is limiting the tree sizes and improvement of light infiltration for fructiferous trees in the crest part. (Fergosen *et al.*, 1991)

The pistachio trees such as the other autumn trees have asleep buds. Asleep buds are the buds that are near ending buds and they don't grow in a season or more. These buds survive in the older trees and are able to produce new branches in case of breaking branches or severe prune. Recent studies about pistachio growth have given more information about the biology of short spurs against tall and flagella form ones. Both branches are produced from the growing meristems that have been specialized during spring standstill in the place of knot (Fergosen *et al.*, 1991). The numbers of these knots are between 7 and 9 in slopes.

Growing branches generating from side buds far from ending branches grow when the knot growth has already been fixed. The ending meristem of these branches after new issue specialization produces the branch for current year growth. As a result, a short branch has already been made. The branches that are formed give a fructiferous spur next year. The linear and flagella form growth near ending bud have been formed from one – year branch. Because of these branches, ending predominance increases the growth. (Fergosen *et al.*, 1991).

Consequently, these branches grow twice or three times during a season. The first growing is at the beginning of spring. In order to study the heading out effects and growth regulators on the hidden bud production, the different sorts of pistachios and their functions in Nooq, Rafsanjan were tested. (Esmailpur, 1375).

In this experiment, 13 to 15–year–old kall–e–quchi and Ouhadi pistachio were used on the domestic. Foundation heading out of one–year–old, two–year–old and three–year–old wood was done before

opening of the buds and eliminating of ending buds at the beginning of the growth season in the fruitful and less fruitful conditions.

Growth regulators were used with the growth starting simultaneously on the branches in the spring. The effects of treatments were examined at the time of harvest in the year that the trees.

The result of heading out of branches showed that the cutting of the lops makes the side branch increase both fruitful and less fruitful conditions for both kinds of pistachios, but the effects on them are different. The heading out heading out two – year – old wood in kall – e – quchi and three – year- old wood in ouhadi made the side branch increase significantly. Ending bud elimination didn't have significant influence on branch – making. Although decreased it that year and increased it next year.

The results of growth generators on the branch – making showed that pbz and 3 – idol benzoic acid had better effect on increasing branch – making than Benzyl adenine.

Pbz is one of the most important Triazole combinations. These combinations prevent the growth and decrease the environmental stress in plants. In a study, the effect of pbz (PBZ) on the decreasing of coldness stress on tomato twig and keeping them in this condition were examined. In this research, PBZ in two different densities (30 and 60 mlg/lit) was sprayed on five – week – year plants. Three days after treatment by PBZ, twigs were exposed to cold weather. The results showed that cold weather increased the membrane porxidation and prolin, but the amount of chlorophyll and carotenoid decreased. Pbz decreased the weigh, inter node and aerial organs but increased the dry weigh of roots and improved them. Also PBZ decreased the amount of membrane porxidation and prolin.

In general, the results of this research showed that treatment by PBZ improved the stress and damages and also it could help the plant to improve against cold weather.

Materials and Methods

A. Kind of research

This research was done in a one – hectare land from Maafoon gardens, Sirjan agricultural company, which has encountered a lot of damages this year.

According to the company's report, the temperature had reached - $4^{\circ}C$ on Friday morning, (16 April).

So that in addition to 100% damages of current year, the ending bud and current year growth had been destroyed. This land was divided into two half – hectare land, and in the first land, 15 days after frost – biting the deep water irrigation was done. Before irrigation, 75 kg nitrogen fertilizer in form of NH_4NO_3 was added to the land. In the second land, the exactly the same activities have done but one month after frost – biting. In the mentioned lands, some trees were chosen. Irrigation, prune and other activities had been done as following:

* Prune treatment in three levels:

1. without prune.
2. Elimination (30%) of grown branches.
3. Elimination (60%) of grown branches.

* Branch – bending treatment in two levels:

1. Branches without bending and change

2. Branches that had been bent by a weight

* Treatment with pbz in three levels:

1. Control.

2. Pbz with 4 PPM densities.

3. Pbz with 8 PPM densities.

Treatment with pbz was done in the form of soil. After providing solution with mentioned densities, the solution was added to the trees foundation.

After treatment applied, in every treatment form (July) the amount of bud decreased and the rest of buds were counted in 10 days. And this action continued until (October). Also, for determining the number of remaining buds, the accounting was repeated in (March). For determining the treatment effects at the time of blossom and the amount of fruit, from April, the time of bud opening, to May, the amount of producing, were counted. For determining the treatment effects on growing, linear growth in some selected branches were measured in (October).

The design of the experiment was in the form of spilit. Main plot included irrigation in 15 and 30 days after frost - biting and secondary plot included prune treatment, branch – bending treatment and pbz treatment. The number of repetition was four. After obtaining data, the analysis was done by some soft wares so that the best treatment was determined.

Conclusion and Discussion

The results about irrigation of lands for forming flowers didn't show a significant difference. It seems that although the irrigation after frost – biting stimulated the growth but did not have any effect on flower producing (diagram 1)

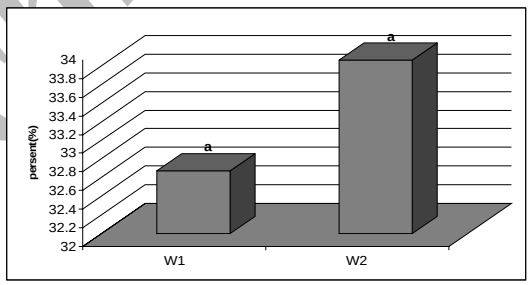

Diagram 1: Irrigation time on bud formation after spring frost – biting

And in this research the amount of nitrogen fertilizer showed a significant difference than lake of nitrogen fertilizer. Irrigation with out nitrogen fertilizer causes the least amount of bud producing (diagram 2).

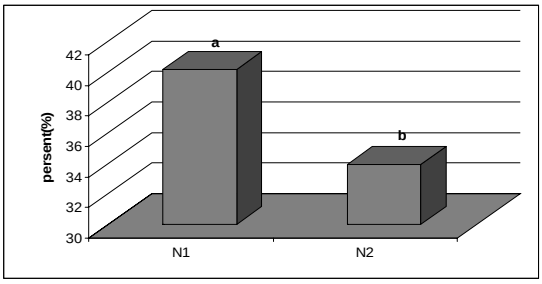

Diagram 2: Effect of nitrogen on bud formation after spring frost – biting

So according to above results, we can say that the amount of nitrogen fertilizer can have an important influence on growing bud. Comparison between example treatment and prune 30% showed that they had the most influence on flower producing. These two treatments did not have significant differences. The least amount of flower formation related to pbz density (diagram 3)

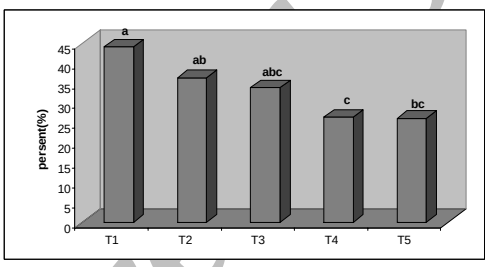

Diagram 3: Effect of treatment on bud formation after spring frost – biting

And the result of mutual effects between irrigation and treatments showed that the adequate irrigation combination and its stress with example and 30% prune had the most flower formation, and the adequate irrigation combination and its streets with different pbz density had the least flower formation.

Two–year–old wood and three–year–old heading out in the fruitful and less fretful conditions caused a decrease in that year and an increase in next year (Esmailpur. 1375).

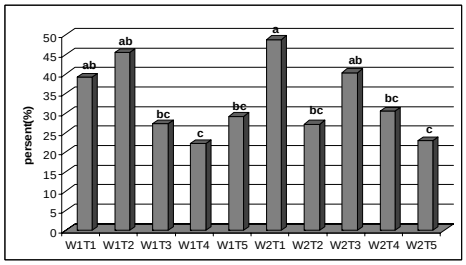

Diagram 4: Mutual effect of irrigation time and treatment on bud formation after spring frost – biting

Although these combinations did not have significant difference but irrigation combinations with prune treatment (30%) and example had significant difference with irrigation combinations with different pbz densities (diagram 4).

And the result of mutual effect between nitrogen and treatments showed that the nitrogen combination with example treatment and nitrogen combination with 30% prune had the most flower formation.

And nitrogen combinations with 60% treatment with nitrogen combination with different pbz densities were the next place. And the least flower formation was about lack of nitrogen fertilizer and 4 P.P.M pbz hormones which had a significant difference with another combination (diagram 5).

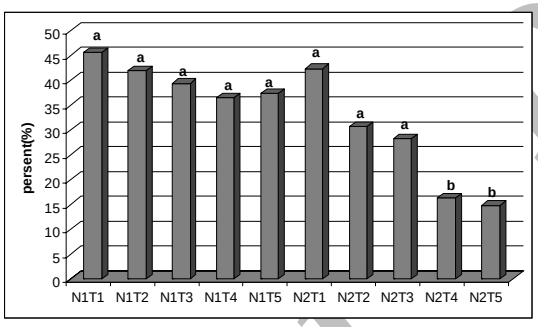

Diagram 5: Mutual effect of nitrogen amount and attendance on bud formation after spring frost – biting

The result of mutual irrigation amount effect between nitrogen fertilizer and treatment showed that the adequate irrigation combination with nitrogen fertilizer and 30% prune had the most flower formation. And the least was related to irrigation without nitrogen fertilizer and 4 P.P.M pbz attendance. According to statistics they did not have a significant difference (diagram 6).

Pruned branches had an important effect on flower formation in pistachio buds after spring frost – biting, and using pbz densities had the same effect specially that year when the trees had pruned.

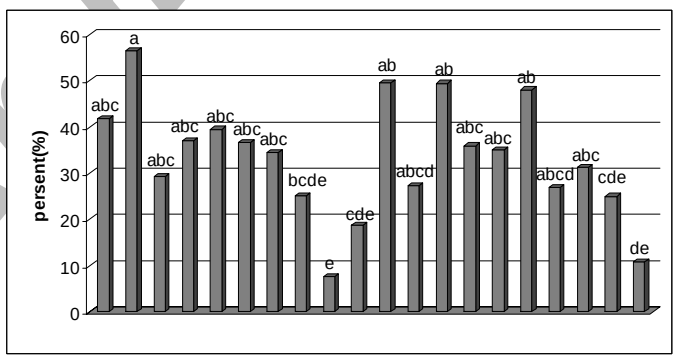

Diagram 6: Mutual effect of irrigation time , nitrogen and treatment on bud formation after spring frost biting

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