STUDIES ON USING SOME NATURAL EXTRACTS IN BREAKING BUD DORMANCY OF GRAPES TO REDUCE THE POLLUTION OF CHEMICAL TREATMENTS

BY

MOHAMED ZAKRIA ABD EL-WADOUD
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A Thesis Submitted in Partial Fulfillment of
The Requirements for the Doctor of Philosophy Degree in
Environmental Sciences

Department of Agriculture Science
Institute of Environmental Studies and Research
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ABSTRACT

This study was carried out for two successive seasons (2008 and 2009) on Flame Seedless grapevines grown in a private vineyard located at 64 kilo-meter from Cairo-Alexandria desert road; to evaluate the efficiency of some new alternatives of some natural extracts i.e. soybean, onion and garlic oils compared to chemical compounds i.e. Mineral oil, Thio-urea and Dormex on dormancy breaking of Flame Seedless grapevines. The vines were grown in a sandy soil, at 1.5 X 2.75 meters apart under drip irrigation system, trellised by the "Y" shape system. The vines were cane pruned during the last week of December at 60 buds/vine (6 canes X 10 buds/cane). Thirteen spraying treatments were applied during the second week of January for both seasons. Three natural extracts i.e. soybean oil, onion oil and garlic oil with three rate for each at 2, 3 or 4% compared to chemical compounds i.e. Mineral oil at 3%, Thio-urea at 3% and Dormex at 5%.

The results showed that spraying Dormex at 5% resulted in earliness in the beginning of bud burst , in addition to, realizing reliable vegetative growth, and good yield with high cluster quality followed in a descending order by spraying Thio-urea at 3% followed by spraying natural extracts i.e. Garlic oil at 3-4% followed by Onion oil at 3-4% while, control vines gave the lowest values for these estimations in both seasons.

Approval Sheet

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2010

صفحة الموافقة على الرسالة

دراسات على استخدام بعض المستخلصات الطبيعية فى كسر طور سكون براعم العنب لخفض التلوث من المعاملات الكيماوية

رسالة مقدمة من الطالب

محمد زكريا عبدالودود
بكالوريوس العلوم الزراعية، جامعة عين شمس، ١٩٨١
ماجستير العلوم الزراعية، جامعة عين شمس، ٢٠٠٣

لاستكمال متطلبات الحصول على درجة دكتوراة فلسفة فى العلوم البيئية

وقد تمت مناقشة الرسالة والموافقة عليها:
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1. INTRODUCTION

Grape (Vitis vinifera L.) is considered the first major fruit crop in its production all over the world. In Egypt, grapes rank second among fruit crops while citrus being the first. The total acreage of grapevines in Egypt exhibited an obvious increase in the recent years till it reached about 167048 feddans with production of 1531418 tons according to the latest statistics of Ministry of Agriculture (2008).

"Flame Seedless" cultivar is an early-ripening cultivar, which ripens through the period from first to mid June. Earliness of Flame Seedless grapes is often accompanied by irregular and low percentage of bud break. These defects are thought to due to the insufficient chilling units required to induce full and uniform bud break.

Dormancy is a phase of development that occurs annually in deciduous fruit trees, (Saure, 1985). Release of dormancy requires a chilling period during winter followed by a temperature rise in spring (Fuchigami *et al.,* 1982).

Artificially inducing bud break on grapevines is of a great important to obtain an efficient, uniform bud break. Many chemical compounds, are effective in overcoming dormancy of fruit trees of temperate climate, such as mineral oil (Samish, 1954) and Thio-urea (Balasubrahmanyam *et al.,* 1975) and however, currently, hydrogen cyanamide (H_2CN_2) is the product most used in the grape world (Dokoozlian *et al.,* 1995), have been used to terminate bud dormancy in grapevines.

Taking into account the reduction or elimination of the use of synthetic substances that advocate sustainable systems of fruit production, the search for new alternatives for breaking dormancy of temperate fruit it is becoming very important. Hydrogen cyanamide, in particular, is a

highly toxic and is classified by the Environmental Protection Agency of the United States in the highest category of toxicity (Category I). Moreover, the record of this product is under review by the European Union (Settimi *et al.,* 2005). Nevertheless, these bud breaking inducing agents are not authorized for use in organic cultivation. Therefore, looking for new opportunities to break dormancy, among the permitted products in organic agriculture are sulphur and its derivatives, such as extracts from garlic and onion (Omri, 2006). The compounds obtained from garlic are mainly derivatives of sulphur (Jirovetz *et al.,* 2001). As well, there are reports that a paste prepared from fresh garlic induces bud breaking in a manner similar to calcium cyanamide, when applied to grapevine buds with insufficient cold (Kubota *et al.,* 2000 and Botelho *et al.,* 2007).

The objectives of this investigation is to determine the efficacy for new alternatives of some natural extracts i.e. Soybean, Onion and Garlic oils compared to chemical compounds i.e. Mineral oil, Thio-urea and Dormex on dormancy breaking of Flame Seedless grapevines.

2. REVIEW OF LITERATURE

The available local and foreign review dealing with the effect of new alternatives of some natural extracts i.e. Soybean, Onion and Garlic oils compared to chemical compounds i.e. Mineral oil, Thio-urea and Dormex as breaking agent compounds on behaviour of buds, yield as well as physical and chemical characters of the berries, morphological and chemical vegetative growth characteristics are listed under the following main topics:

1. Bud behaviour:

Natural extracts:

Garlic and onion have been widely used for stimulating bud break in various fruit species and various grape cultivars since a report by **Kuroi *et al*., 1963** when 'Muscat of Alexandria' vines in a deeply dormant stage are to be forced, a paste of fresh garlic (Allium Sativum L.) had been applied to cane cross-sectional surfaces immediately after pruning to stimulate bud break. This method for breaking bud dormancy in vines with garlic paste was first used in 'Muscat of Alexandria' vines.

Kubota and Miyamuki, (1992) treated four dormant grapevine cultivars immediately after pruning with paste of fresh garlic to break bud dormancy. Garlic paste significantly accelerated bud break and increased the rate of bud break.

Kataoka and Sugiyasu, (1994) treated dormant peach and Sweet cherry with garlic juice or oil. The treatments were given on the 12th Dec., 10th Jan. and 1st Feb and coincided with warming of the trees to encourage bud break. With peach, treatments were ineffective when applied on 12th Dec. Treatment with 10% garlic oil on 10th Jan advanced flower bud break compared with controls. Treatment with l0% garlic oil on 1st Feb.