DISINFECTION OF ROOTED GRAFTED VINES BY HOT WATER TREATMENT (HWT)

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1. INTRODUCTION

Hot water treatment (HWT) of plants can be defined as the subjection of the plant to water temperatures high enough and of long enough duration to destroy the pathogens, but not so high as to kill the plant. It is today being used widely in freeing many kinds of plants and seeds from injurious insects, phylloxera, nematodes, fungi and some bacteria.

On vines, HWT was probably first used in California where it was approved as an alternative to the quarantining of phylloxera-infested vines. Positive results were also obtained in getting rid of mycoplasm and Rickettsia-like organisms (Flavescence dorée and Pierce's disease). In South Australia the spread of Phylloxera was successfully controlled in this way (1).

2. OBJECTIVES OF HWT IN SOUTH AFRICA

2.1 The main objective is to prevent the spreading of the following pathogens:

(Slides 1 and 2)

2.1.1 Phytophthora cinnamomi, a soil fungus, which is the cause of the sudden die-back disease to which some rootstock cultivars, amongst others the commercially most important 99 Richter, are susceptible. The cause of the disease could often be traced back to infected nurseries.

2.1.2 Xiphinema index nematode, the soil borne vector for grape-vine fanleaf virus. The combination of X. index in the soil and grape-vine fanleaf can potentially be very dangerous, infecting healthy plant material in the vineyard. It has been determined that X. index is at the moment still confined to isolated areas in the Western Cape, but as the actual extent is not known and as infected nurseries have come to light, it is urgently necessary for further spreading to be prevented.

2.2 POSSIBLE ADDISIONAL ADVANTAGES OF HWT

2.2.1 Phylloxera : The spreading of Phylloxera on the roots of rootlings and rooted grafted vines to uninfected areas can be inhibited.

2.2.2 Inactivation of bacterial blight and crown gall bacteria.

2.2.3 Inactivation of mycoplasm and Rickettsia-like organisms.

3. POSSIBLE DISADVANTAGES

3.1 THE STIMULATING EFFECT ON BUDDING

In practice this is no problem, as budding normally starts on the apical buds. HWT must be applied shortly before planting of the vineyard and it should preferably not be applied to vines of which the buds are not completely dormant.

3.2 Treated material should not again come in contact with infected soil. Treated vines in an infested area should preferably be despatched to their destinations immediately after treatment.

3.3 If the disinfected vines are planted in heavily infected soil (e g P. cinnamomi) the reinfection may be more severe because the organisms which might normally have had an antagonistic effect against harmful organisms, are also killed.

3.4 Possible benificial mycorrhiza can be inactivated and if planted in fumigated soil in which these organisms were also killed, weak growth might occur.

In order to counter the effects mentioned in 3.3 and 3.4, the treated vines can be treated with disease-free top soil before planting.

3.5 Special equipment is required for large scale treatment.

4. TREATMENT TIME AND TEMPERATURE RECOMMENDED

According to literature (1, 2, 3), the optimum temperature and time of treatment are 50 °C for 15 minutes. At this combination of temperature and time all mentioned pathogens are destroyed without harming the vine. According to Marais, 1979 (Table 1) better growth (Root mass, shoot mass and shoot length) was obtained after 8 months with this treatment of one year old Chenin blanc vines on 99 Richter rootstock than with the not treated controll.

TABLE 1

TABLE 1: Root and shoot mass and shoot length from one year old Chenin blanc/99R vines treated with hot water at 50°C for various periods and after 8 months growth in a nursery. (Marais, 1979).

TREATMENT PERIOD (minutes)	ROOT MASS (g)	SHOOT MASS (g)	SHOOT LENGTH (cm)
0 (Control)	53	22	300
10	72	23	306
15	126	58	605
20	101	45	440
30	119	59	508
D Values (P 0,05)	9,45	9,51	11,82

5. COMMERCIAL APPLICATION OF HWT IN SOUTH AFRICA

5.1 A nurseryman is obliged to give his grafted vines HWT if a government inspector finds any evidence of Phytophthora C. or lesion and rootknot nematodes in his nursery, prior to selling of the vines. Otherwise HWT is applied by nurserymen only when it is demanded by producers.

5.2 THE MACHINE

(Slides 3 and 4)

5.2.1 A machine, demonstrated on this slides was developed by KWV in co-operation with a private engineering company by means of which hot water treatment of one year old grafted vines can be executed in a continuous process. It consists of a hot water bath of stainless steel in which the water temperature is maintained at exactly 50 °C + 0,5 °C. The externally heated water is circulated through the bath rapidly to keep the water at a constant temperature. External heating takes place by means of a gas burner of which the size of the burning nozzle is automatically changing in order to keep the circulating water at a constant temperature. The second part of the machine consists of a radiator cooled bath in which the water temperature is kept at room temperature.

The rooted grafted vines move in bundles of 50 for exactly 15 minutes through the hot water bath and fall into the cold water bath thereafter. If a big enough source of exchangeable cold water is available, the latter part of the machine can be omitted.

Altered versions of this machine are now built commercially, without the cooling section by a private engineering company.

5.2.2 Capacity

Depending on the growth of the vines, about 4 000 vines are treated per hour at a total cost of about R30 per 1 000.

5.3 PRECAUTIONS

5.3.1 The roots of the vines must be cleaned from soil thoroughly before HWT.

5.3.2 Treated vines must be carefully layered to prevent drying out, which easily takes place after treatment.

LITERATURE CITED

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Beeinflussung der Knospenruhe mit SKW 83010 im Weinbau

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Zusammenfassung:

Der Pflanzenwachstumsregler SKW 83010 ist ein neu entwickeltes Produkt, der die Knospendormanz von Rebstöcken beeinflußt. Mehrjährige Versuchserfahrungen aus dem In- und Ausland ergaben, daß erstmalig die Lösung von Dormanzproblemen unter den Verhältnissen des praktischen Weinanbaues möglich ist. In wintermilden Regionen wird eine Verfrühung des Knospenaufbruchs erzielt. Damit ist eine Vorverlegung der Wachstumsperiode mit der Möglichkeit einer früheren Ernte verbunden. Sowohl unter wintermilden Bedingungen als auch in Gebieten mit Winterfrost ist es möglich, einen völlig gleichmäßigen Knospenaustrieb zu erreichen. Die beschriebenen Effekte werden an Hand von Versuchsergebnissen demonstriert.

Abstract:

Effect of SKW 83010 on bud dormancy in grapes

The plant growth regulator SKW 83010 is a newly developed product which effects the bud dormancy in grapes. Experience from several years in Germany and abroad showed that SKW 83010 is a product which solves dormancy problems under practical conditions. In areas without sufficient chilling the application results in earlier bud break and consequently in earlier harvest. Uniformity of bud break is improved in areas without sufficient chilling as well as in areas where frost occurs. Data from various experiments with SKW 83010 are given.

1. Einführung

Das Auftreten einer saisonalen Ruhephase ist von dem jährlichen Entwicklungszyklus mehrjähriger Pflanzen her bekannt. Während bei einjährigen Pflanzen nach Ablauf der Vegetationsperiode ein langsames Absterben einsetzt und nur die Samen ein Überleben der Art sichern, zeigen perennierende Gewächse wie die Weinrebe abwechselnd Phasen des aktiven vegetativen und generativen Wachstums und Perioden der Ruhe. Außer bei einigen tropischen Spezies tritt die als Dormanz bezeichnete Ruheperiode bei nahezu allen ausdauernden Gewächsen irgendwann in Erscheinung und unterliegt der Steuerung durch endogene und exogene Faktoren, wie z. B. Wasserversorgung, Temperatur oder Interaktionen pflanzeneigener Hormone. So ist z. B. bekannt, daß sich niedrige Temperaturen nahe dem Gefrierpunkt positiv auf die Beendigung der Dormanz auswirken, ein Vorgang, wie er bei der Stratifikation von Samen künstlich nachvollzogen wird.

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