

Research Note

Elimination of mites from the buds of dormant grapevine cuttings by hot water treatment

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S u m m a r y : The suitability of hot water treatment was tested for eliminating overwintering mites from dormant grapevine buds. Treatment at 52 °C for 60 min completely eliminated mite infestation, but did not or only slightly influenced the viability of grapevine buds. In greenhouse experiments we demonstrated that treated plants frequently showed a better growth, most probably due to the elimination of mite infestation. This additional application of hot water treatment provides a simple, environment-friendly and economical method to prevent spreading of grapevine mites.

K e y w o r d s : mites, dormant buds, thermotherapy, cutting, shoot, growth.

Introduction: Thermotherapy has been extensively studied to cure plant propagating material from a wide range of plant pathogenic viruses, bacteria and fungi (for review see: GRONDEAU and SAMSON 1994). Hot water treatment of dormant cuttings has now been introduced in viticulture in several countries as well to eliminate *Agrobacterium vitis* from grapevine propagating material thus preventing spreading of crown gall disease (BURR *et al.* 1989, OPHEL *et al.* 1990, BAZZI *et al.* 1991). This method is also effective against the mycoplasma disease, flavescence dorée (CAUDWELL *et al.* 1990). Surprisingly, some hot water treated grapevine varieties showed better growth vigour than the non-treated controls (OPHEL *et al.* 1990, BAZZI *et al.* 1991). We also observed this phenomenon for the cultivars Pearl of Zala and Riesling in Hungary (SZEGEDI and SZÉCSI 1994).

Leaf mites (e.g. *Calepitrimerus vitis* NALEPA, *Panonychus ulmi* KOCH and *Colomerus vitis* PAGENSTECHE) may cause serious economic losses and reduce the growth of green grapevine shoots (PEARSON and GOHEEN 1988). Since mites can overwinter in the buds (DELLEI and SZENDREY 1991) they spread in propagation material causing damage in nurseries and vineyards.

It was reasonable therefore to assume that the better growth vigour of hot water treated grapevines may have resulted from the elimination of heavy mite infestations. To study this possibility we examined the effect of hot water treatment on the survival of mites overwintering in buds.

Materials and methods: Dormant canes of different varieties (Tab. 1 and 2) were collected in the Eger region

(Northern Hungary) or in Kecskemét (Great Plain region) between February 17 and March 10, 1994 and surface sterilized with 0.5 % (w/v) Solvochin. The canes were stored in plastic bags in a cold room (4–6 °C). Treatments were carried out at 52 °C for 60 min which was previously shown to be efficient for killing agrobacteria (SZEGEDI and SZÉCSI 1994), but not harmful to dormant buds (WAMPLE 1991). For control experiments canes were incubated in water at room temperature (18–22 °C) for 60 min. The number of surviving mites were determined microscopically at various intervals (from 2 to 14 d) after treatment on the basis of their mobility.

To test the effect of hot water treatment on the viability of buds, greenhouse experiments were also carried out. Two-bud cuttings of the examined varieties were shooted in sand or in perlite. Results were scored after 2 months by measuring the percentage of buds that grew and shoot length.

Results and discussion: The predominant mite species found on our cuttings was *Cal. vitis* (90–95 % of the population depending on the sample), while *Zetzellia mali* EWING, *Col. vitis*, Tydeidae and Tarsonemidae sp. mites occurred at variable, but always at very low (from 0.1 to 3 % of population) frequencies. These infestations were completely eliminated by the hot water treatment since only mortal mites were found following incubation of canes at 52 °C for 60 min. Summarized data, obtained after scoring > 500 treated grapevine buds and > 11,000 treated mite individuals, are shown in Tab. 1. Eggs of the European red mite *P. ulmi*, which causes serious damage on grapevine in several locations (PEARSON and COHEEN 1988, RILLING and DÜRING 1990), were also killed by the hot treatment (data not shown). Some dead mites were also found in the non-treated controls, but the reason of this mortality is unknown.

Table 1
Effect of hot water treatment on overwintering mites

Variety*		infected/total number of buds (%)	Living number of mites	Mortal
Green Veltliner	C	30/90 (33)	407	16
	T	48/90 (53)	0	514
Kunleány	C	86/98 (87)	1506	515
	T	46/83 (55)	0	1018
Hárslevelü	C	32/75 (42)	1600	0
	T	36/75 (48)	0	1758
Müller-Thurgau	C	38/75 (50)	1550	0
	T	41/75 (54)	0	1771
Italian Riesling	C	22/75 (29)	495	0
	T	28/75 (37)	0	828
Merlot	C	57/75 (76)	1925	0
	T	54/75 (72)	0	4225
Chardonnay	C	38/75 (50)	1060	0
	T	30/75 (40)	0	950

* C = non-treated controls and T = hot water-treated samples.

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To test if the treatment used reduce the viability of dormant buds, the grapevine cuttings were shooted in greenhouse. The results of this experiments show that the heat treatment did not influence the viability and growth of the tested varieties (Tab. 2). The treated plants were free of mites, while the control plants were infested at the frequency expected on the basis of the bud examinations. In the case of some grapevine varieties (rootstocks 5 BB and 5 C and cv. Blaufränkisch) the hot water treatment was lethal to the primary buds, but the secondary buds were still viable and formed healthy shoots after a delayed budburst (unpublished data). It is not clear yet if this reduction of viability is due to a variety-specific sensitivity or due to the weak maturation of buds caused by the extremely dry summer in Hungary in 1993.

Table 2

Effect of hot water treatment on the shoot growth of the tested grapevines

Variety*		Viable/total number of plants (%)	Average length of shoots*
Green Veltliner	C	37/40 (92)	6.96
	T	31/36 (86)	6.16
Kunleány	C	28/31 (90)	5.24
	T	28/32 (87)	6.59
Hárslevelü	C	24/24 (100)	4.31
	T	32/33 (97)	5.67
Müller-Thurgau	C	23/24 (96)	5.41
	T	33/34 (97)	6.29
Italian Riesling	C	24/25 (96)	3.54
	T	31/38 (81)	3.68
Merlot	C	45/46 (98)	7.07
	T	50/50 (100)	6.12
Chardonnay	C	24/29 (83)	2.86
	T	51/51 (100)	4.14

* C = non-treated control and T = hot water-treated samples.

differences which are significant at $p = 5\%$ (in *t*-probe) are in bold numbers.

Our data show clearly that hot water treatment, which was recently introduced to produce *Agrobacterium*-free propagating material, can also be used to eliminate the grapevine leaf mite *Cal. vitis* and other mites from dormant grapevine buds. This method requires no specialized equipment (can be used on the farm), is economical and environment-friendly. By preventing the spread of mites in propagation material it may be possible to reduce markedly the amount of pesticides needed and spraying costs in grapevine nurseries and plantations.

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