IPM-Based Guidelines for Replanting Grapes in 2000 without Methyl Bromide

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October 2000

A few grape rootstocks are quite sensitive to the "rejection component" of the replant problem (RP). The best example is Teleki 5C. It grows poorly the first several years if replanted without soil fumigation. However, for grapes it is generally the "soil pest and disease component" of RP that has given reason to pre-plant fumigate. Grapes are host for many soil pests and certain rootstocks are particularly sensitive. Examples include AxR1 replanted into a phylloxera infested site, 1103P or Rubired replanted into a *Xiphinema index* site, Grenache replanted into a ring nematode site, Thompson Seedless or Harmony replanted into a warm, sandy site having root knot nematode, or Zinfandel replanted into a site of *Pratylenchus vulnus*. Key soil pests within each vineyard need to be identified.

When old vine trunks are pushed the remaining roots are too abundant and too scattered for physical removal. These remnant roots can survive as a host to the pest or disease for at least 8 years. As new and old roots grow together the pest resistance mechanisms within the new rootstock must be durable or the sheer number and diversity of pests can result in selection of pest biotypes more aggressive than the original pest. **Broadcast** soil fumigation has helped to conserve pest resistance mechanisms in grape rootstocks. To determine the efficacy of a soil fumigation search for live remnant roots about 30 to 60 days after the treatment. We have not found a systemic herbicide treatment that will adequately kill the old root system before vines are pushed. Root penetrating products such as Telone II at 35 gallons per acre or products such as Vapam drenched at 250 ppm metam sodium can provide root kill down to 4½ ft to 3 ft, respectively.

There is benefit to waiting a full year between vine removal and replanting, however this waiting period is not as beneficial as it is when replanting after tree crops. A major benefit afforded by a year of fallow is that it provides time to properly dry the soil before fumigation. Three alternatives to methyl bromide (MB) use are currently available:

<u>#1 Telone/Vapam alternative</u>. Dry the soil, rip and level as required. A requirement for Telone II applications at 35 gallons per acre is that there be adequate moisture 12 inches above the shank delivery depth. It is self-defeating to meet this requirement when the soil has just been deep ripped. Perhaps someday there will be an alternative to this moisture requirement if we are to get optimum use of the Telone applied. Do not permit pre-treatment irrigation water to move deeply into soil and do not use leaky irrigation pipes. The Telone II treatment should be followed within several weeks by several acre-inches of water containing 250 ppm MS. This drench will provide the surface control that was previously provided by MB and a tarp and compared to a MB treatment will improve slightly the first-year growth of vines. The MS drench is important in finer-textured soils and highly porous soils where ring nematode is of concern. Plan to apply

the Telone II before 2 inches of rainfall (usually before November 15). Apply small quantities of a diversity of macro and micronutrients within 6 weeks after planting. Telone treatments perform best in coarse textured soils.

#2 Vapam/"BNR" rootstocks alternative. If planting a rootstock possessing "broad soil pest resistance" or "broad nematode resistance (BNR)" or the rootstock selected has durable resistance to all soil pests present treat a four-foot wide zone along the planting row by drenching with Vapam through an existing or temporary drip line. This can be accomplished by the temporary placement of two drip lines or another option is to pull the entire hose length forward by two feet about half-way into the drenching. The 250 ppm MS drench can provide an excellent pest killing dosage down to five foot deep in a four foot wide swath which will provide one full year of pest relief for the new vine. Soil treated at dosage rates higher than 250 ppm should not be planted for a full year if maximum growth is anticipated. It is preferred to have vine stakes in the ground prior to treatment. Apply small quantities of diverse macro and micronutrients within 6 weeks after planting.

If resistance mechanisms within the selected rootstock are non-durable then method #2 can result in selection of pest biotypes more aggressive than the original. Recent examples include the phylloxera resistance in AxR1 and the root knot resistance in Harmony.

Commercially available rootstocks having broadest nematode resistance are Ramsey, Freedom and Teleki 5C. However, resistance mechanisms against root knot nematode in the first two listed are not durable beyond 14 years in many warm, sandy soils. These two rootstocks do possess tolerance to nematode pressure that carries them beyond 14 years. Experimental rootstocks appearing to have durable and broad nematode resistance include: 10-17A, RS-3 and RS-9.

#3 broadcast drench of Vapam. Delivery lines used in method #2 can be further used to make a broadcast treatment by successively pulling them toward the center of the drive row at 12 inch increments. Use of a garden hoe is suggested. The goal would be to duplicate a ½ gal/hr drip emitter placed over each square foot for 8 hr. If carefully accomplished the entire field surface area can be drenched with Vapam down to the same depth as indicated for Method #2. For each acre use no more than 75 gallons per acre Vapam HL delivered in 160,000 gallons of water (6 acre-inches).

Note: None of the rootstocks having "broad nematode resistance" is commercially available. They are graft compatible but more information is needed about the vigor they impart.

For more information on the Replant Problem and its various components refer to a text entitled "The Replant Problem and Its Management," 1999, by Michael McKenry. You can find it online at http://www.uckac.edu/nematode

Table 1. Susceptibility or resistance of various grape cultivars to various nematode populations.

Rootstock	Populations of *Meloidogyne* spp.									*Xiphinema* spp.				
	Mi	Mj	Mm	Ma pt H	Ma pt F	Mc-L	Mc-D	Pv [1]	Ts [2]	Xi	Xa	Xc-1	Xc-2	Cx [3]
Ramsey	R	R	R	HS	HS	S	R	R	S	9	71	-	-	100
Freedom	R	R	R	HS	HS	R	S	SS	S	2	10	S	-	50
Dogridge	R	R	R	HS	HS	-	-	S	S	24	15	-	-	123
1613C	R	R	MR	HS	HS	S	S	SS	S	7	72	-	-	164
Harmony	MR	R	R	HS	HS	S	S	SS	S	24	52	-	-	35
Teleki 5C	SS	MR	S	S	HS	S	-	S	S	9	72	-	-	65
Oppenheim-4	SS	MR	S	S	-	-	-	S	S	6	43	-	-	65
Schwarz.	S	MR	S	HS	HS	-	-	SS	S	5	13	-	-	42
039-16	S	S	HS	S	S	-	-	S	S	2	5	S	-	-
99R	HS	S	S	S	-	-	-	S	SS	54	28	-	-	71
3309C	HS	S	HS	HS	HS	-	-	SS	S	20	44	-	-	136
Thomp. S.	S	S	HS	HS	S	S	HS	S	S	100	100	100	-	100
Flame S.	S	S	HS	S	S	S	S	S	S	154	32	-	-	185
Rubired	S	S	S	S	-	-	R	S	SS	365	51	-	-	59
K51-32	R	SS	S	S	-	-	-	R	S	2	52	-	-	272
Grenache	-	-	-	-	-	-	-	-	-	-	-	-	-	251
Boerner	R	-	SS	-	-	-	-	MR	MR	13	-	-	-	89
101-14	MR	-	MR	-	-	-	-	S	-	76	-	-	-	121
5BB	S	-	MR	-	-	-	-	S	HS	92	-	-	-	149
110R	R	-	S	-	-	-	-	S	MR	60	-	-	-	97
Chardonnay	HS	-	HS	-	-	-	-	S	S	-	-	-	-	-
Cab. Sauv.	HS	-	HS	HS	HS	S	-	-	-	-	-	-	-	-
USDA Selections														
6-19B	R	R	R	SS	MR	R	MR	R	R	15	2	1	30	12
10-17A	R	R	R	R	R	R	R	R	R	2	-	1	16	24
10-23B	R	R	R	R	R	R	R	R	R	5	-	1	7	19
Ramsey x Schwarzmann Selections														
RS-9	R	R	R	R	R	R	R	-	-	10	-	-	-	103
RS-3	R	R	SS	SS	MR	SS	SS	-	-	13	-	-	-	45
RS-2	SS	-	SS	S	S	S	SS	R	-	63	-	-	-	67

Resistant	R = <0.2 nematodes/gr root
Moderate resistance	MR = 0.21 to 0.6 nematodes/gr root
Slightly susceptible	SS = 0.61 to 3.0 nematodes/gr root
Susceptible	S - 3.1 to 180 nematodes/gr root
Highly susceptible	HS = 180+ nematodes/gr root

- = no data

For ectoparasites population buildup is expressed as a percentage of that level built up on Thompson Seedless. Levels of 100 are normal, levels of 5 indicate moderate resistance, and levels of 2 indicate resistance.

[1] *Pratylenchus vulnus*
[2] *Tylenchulus semipenetrans*
[3] *Criconemella xenoplax*