

Vitis 13, 1—3 (1974)

Station de Recherches de Viticulture (INRA), Pont-de-la-Maye, France

A technique for improving the germinability of grape seeds for breeding purposes

by

M. M. OTTENWALTER, C. BOUSSION, J. P. DOAZAN et M. RIVES

Une technique pour améliorer la germinabilité des graines de vigne pour les besoins de l'amélioration

Résumé. — Une technique, consistant à obtenir des grappes sur des boutures préenracinées puis soumises à un effeuillage très précoce au débourrement, permet de cultiver des plantes fructifères en serre. Les graines ainsi obtenues ont une proportion de germination meilleure, ce qui a permis en particulier d'obtenir des descendants d'un mutant précoce du Cot dont les graines obtenues au champ ne germent pratiquement jamais.

Seeds of some varieties have a very poor germinability even when available techniques of seed treatment are used, as that of BALTHAZARD (1969). We currently use 75 days at 2—4 °C in moist perlite as a stratification treatment (RIVES 1965). In one of our breeding programs, we make use of a mutant of "Cot" (= "Malbec") which is earlier than the type by approximately 30 days, while retaining the characters of the variety. In this mutant, phase I of COOMBE (1960), that is from fruit set to véraison, is dramatically shortened.

Following the stratification period, seeds are sown in Petri dishes, on moist filter paper and placed in an oven at 25 °C. Seeds whose radicle has emerged (designated as "germinated" in the following) are picked up daily or every other day and planted in sand in small compressed-peat pots (2 × 2 cm) which are subirrigated with a nutrient solution in the greenhouse. When 20—30 cm high, the seedlings are transferred in larger peat pots (diam. 7 cm) with the same medium and irrigation. When 30—50 cm high, the seedlings are transferred to their definitive place on hydroponic beds in the greenhouse. A selection is normally practiced on the occasion of this final transfer, but in the case of "Cot précoce" this was not done except where stated. Thus differences in the figures from column "number germinated" to column "established seedlings" in Table 1 is only due to natural death

Table 1
Seeds collected in the field
Les graines récoltées au champ

Year	Pollination	Progeny specification	Number of seeds		Number of seedlings established
			Sown	Germinated	
1967	self	18	326	6	2
1968	self	18 through 25	253	0	—
1969	self	bulk	164	4	1
1970	self	bulk	159	0	—
1971	open	11	112	0	—
		(11)	(112)	(3)	—
1971	open	11a	76	2	1
1971	self	12	73	2	2
	open (fermented)	13	105	0	—
Total			1278	17	6

occurring from the Petri dish to the last transfer. Table 1 shows the results we have obtained since 1967.

Up to 1971 we have observed a total of 17 germinated seeds, giving a final count of 6 established seedlings on a total of 1278 seeds collected from open-pollination or selfing on field vines.

It may be observed that the few germinated seeds were collected in 1967, 1969, 1971, that is in years that were good for wine, when good weather conditions prevailed during the period from blooming to maturity. The germinated seeds of the second line for "1971 no. 11" did so after a second period of stratification following redrying, a technique that frequently leads to good results with other varieties (POUGET, pers. comm.). Progeny no. 13 in 1971 consisted of seeds which were saved from the press-cake after micro-wine-making. Seeds having passed through fermentation should normally germinate well.

T a b l e 2
Seeds collected in the greenhouse
Les graines récoltées en serre

Year	Pollination	Progeny specification	Number of seeds		Number of seedlings established
			Sown	Germinated	
1971	open	14	7	6	6
1971	open	15	45	17	3
Totals			52	23	9

The figures of Table 2 were obtained from seeds collected in the greenhouse on "small fruiting vines" (ALEXANDER 1966) that were obtained by a technique inspired by MULLINS (1966, 1967). Cuttings were pre-rooted by putting them upon a heating bed in a cold frame exposed to the North in February when outdoor temperatures were too low to allow bud burst. These rooted cuttings were then transferred to the greenhouse for sprouting. Young leaves were severed as they began to become visible up to the first bunch, while a benzylaminopurine solution (100 ppm) was applied once to the whole bursting bud.

Later development was normal, except that the inflorescences proved to be highly fragile, more likely due to the environment (low light) than to the treatment itself. This prevented the use of the plants as female parents in artificial crosses as emasculated inflorescences died back from the traumatism. Two inflorescences set fruit when open pollinated and this matured normally, yielding a good crop of seeds, 52 in all, among which 23 germinated. In the case of no. 15, a selection was practiced at the last transfer.

These results are in agreement with WAGNER'S (1962) results and recommendations. Covering the vines in the fields with glass (WAGNER 1962) or plastic (WAGNER 1969 and our unpublished results) improves the set and the seed yield in crossing work. RIVES (1965) reported on the difference of germinability between seeds collected in the greenhouse and in the open on "Sauvignon" plants of the same origin during the very "bad" year of 1963. We have already noted that germinated seeds were only observed in good years.

On peaches, MONET (1968) has also observed that the stones of early varieties which normally do not germinate well will do so if produced on trees that were kept

in the greenhouse from before blooming time up to maturity of the fruit. However, in this last case the difference between environments should be much higher than in the case of the grapevine, owing to the earlier period of the year for embryo development.

This technique provides a good means to obtain germinable seeds from varieties, most frequently early ones, whose seeds do not usually germinate well, while necessitating no delay from decision to harvest, such as the two or three years that would be necessary if one had to start again from cuttings through the ordinary processes of the nursery.

Summary

A method, using bunches from pre-rooted cuttings which are defoliated very early during bud burst, allows the cultivation of fruiting plants in the glass-house. The germinability of the seeds obtained in this way is improved, which permits, in particular, progenies of an early mutant of the cultivar "Cot", the seeds of which obtained in the field do practically never germinate.

References

- ALEXANDER, D. McE., 1966: The propagation of small fruiting Sultana vines. *J. Hort. Sci.* **41**, 85—86.
- BALTHAZARD, J., 1969: Températures alternées, longueur des embryons et pouvoir germinatif des graines de Vigne. *C. R. Hebd. Séances Acad. Sci.* **269**, 2355—2358.
- COOMBE, B. G., 1960: Relationship of growth and development to changes in sugars, auxins and gibberellins in fruits of seeded and seedless varieties of *Vitis vinifera*. *Plant Physiol.* **35**, 241—250.
- MONET, R., 1968: Méthode permettant l'obtention de plantes à partir d'embryons de variétés très précoces chez le pêcher. *Ann. Amélior. Plantes* **18**, 85—91.
- MULLINS, M. G., 1966: Test plants for investigations of the physiology of fruiting in *Vitis vinifera* L. *Nature* **209**, 419—420.
- — , 1967: Morphogenetic effects of roots and of some synthetic cytokinins in *Vitis vinifera* L. *J. Exp. Bot.* **18**, 206—214.
- RIVES, M., 1965: La germination des graines de vigne. I. Essais préliminaires. *Ann. Amélior. Plantes* **15**, 79—91.
- WAGNER, E., 1962: Gewinnung von *Vitis*-Pollen für Kreuzungszwecke. I. Auswirkungen des Vortreibens der Reben. *Vitis* **3**, 117—129.
- WAGNER, R., 1969: Miglioramento genetico della Vite. *Seminar. ten. del Ist. di Colt. Arbor. Univ. Pisa* **8**, 3—29.

Eingegangen am 15. 10. 1973

M. RIVES
Sta. Rech. Viticulture
(INRA)
33140 Pont-de-la-Maye
France