

GRAPEVINE RESPONSE AFTER FIVE YEARS OF SIMULATED MECHANICAL PRUNING

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SUMMARY

The principal obstacle to the introduction of mechanical pruning in Spain, is that mechanical harvesting haven't reached the spanish viticulture.

Although further studies are needed, first experiments with simulated mechanical pruning on Cv. Garnacha in Rioja Alta for five years seems to indicate that mechanical pruning has many possibilities to be successfully applied to different situations of Spanish viticulture.

INTRODUCTION

We haven't got, at the moment in Spain, the last phases of integral mechanization in viticulture, that is to say, mechanical harvesting and pruning.

Mechanical harvesting is quite developed in most of the principal wine countries but not in Spain. There are two principal reasons: The «en vaso» training system, typical of our country, is very difficult to harvest mechanical and, on the other hand, manual harvesting is very easy and cheap in Spain.

Harvesting is a fully mechanised practice for the main training systems used in the world but, our «en vaso» system brings a lot of problems due to the short trunk and/or open arms and so the permanent wood shoots aren't sufficiently aligned.

In relation with manual harvesting we can say that handwork in Spain is cheaper than in other countries and

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moreover the low yield for vineyard make this practice relatively fast.

These are two principal reasons why mechanical harvesting is not introduced in our country.

The adoption of mechanical pruning in vineyards, must be subsequent to the introduction of «mechanical harvesting» since we can't think about manual harvesting, in a vineyard mechanically pruned. So the principal obstacle in that mechanical pruning, is that mechanical harvesting haven't reached the spanish viticulture.

About pruning the situation is similar to the harvesting, but with one difference; our training system is better adapted to mechanical pruning than to mechanical harvesting. A very important aspect is the low cost of manual pruning in Spain. Again our training system seems to be easy, fast and cheap for manual pruning. The necessity of handwork to prune is about 3-5 working day/ha, depending on the plant density. Having in consideration the cost of the handwork, results a cheaper practice than in other countries and other training systems.

With independence of this justification appears very interesting to study the possibilities of integral mechanization in our vineyards because, more and more, we tend towards a minor dependence on handworkers.

It's urgent to know perfectly the adaptation between our training system and integral mechanization. If this adaptation is good, we'll continue using the actual training system. If, on the contrary, we can't reach a suitable adaptation we'll have to use another easier mechanization systems. According to ecological conditions, cultural practices and varieties of spanish viticulture, these systems should be of simple structure and small developing, for example «Cortina Semplice» or «Cordon Royat», both systems well adapted to integral mechanization.

The first experiments of mechanical pruning in the world date on the sixties in Argentina (Casares *et al.*, 1967) and United States (Shaulis *et al.*, 1972), but the main results are relatively recent: 1974 in Australia (May and Clingeffer, 1977), 1975 in Italy (Baldini *et al.*, 1976) and 1980 in France (Carbonneau *et al.*, 1979). We started in Spain, in 1983, an experiment of simulated mechanical pruning with the aim of knowing the

behaviour of the vine to this practice. This experiment, that should be considered as preliminary is the first about mechanical pruning in Spain.

MATERIALS AND METHODS

The experiment was carried out in Rioja Alta using a thirty years old vineyard of Cv. Garnacha on 3,309 C rootstock at a 2,10 × 1,50 m. row × vine spacing, «en vaso» trained and spur pruned.

During five consecutives years a standard mechanical pruning, using scissors, was simulated.

In the third, fourth and fifth years from the beginning of the experiment, the production and growth were taken.

RESULTS

The results concerning to the third year from the beginning of the experiment are shown in Tables 1 and 2. The rainfall in this year (1986) was very low.

Tables 3 and 4 present the same results from the fourth year (1987). The production data was taken 15 days before the normal harvesting date.

TABLE 1

Winter mechanical pruning on cv. Garnacha «en vaso» trained third year results (1986)a

Poda mecânica (invernal) da cv. Garnacha conduzida «em vaso».
Resultados do 3.º ano (1986)a

Type of pruning	Dormant buds per vine (N.)	Sprouting buds per vine		Yield per vine (kg)	Must soluble solids (‰)	Total acidity (g/l tar.)	pH
		(N) > 15 cm	(‰)				
Manual	13,6(A)	16,2(A)	119(A)	1,58(A)	21,5(A)	5,72(A)	3,21(A)
Mechanical	47,6(B)	39,0(B)	82(B)	2,44(B)	20,3(A)	5,50(A)	3,19(A)

Values with unequal letter differ significantly AT P = 0,05

TABLE 2

Winter mechanical pruning on cv. Garnacha «en vaso» trained thirds
year results (1986)b

Poda mecânica invernal da cv. Garnacha conduzida «em vaso».
Resultados do 3.º ano (1986)b

Type of pruning	Custers per vine (N.)	Custer weight (G)	Berries per custer (N)	Berry weight (G)	Pruning weight per vine (G)	Shoot weight (G)	Shoot length (C.M.)	F/V
Manual	26,6(A)	60,74(A)	48,78(A)	1,24(A)	374(A)	23,9(A)	88,4(A)	4,22(A)
Mechanical	57,4(B)	42,44(B)	38,76(A)	1,09(B)	248(A)	9,06(B)	51,3(B)	9,83(B)

Values with unequal differ significantly AT P = 0,05

TABLE 3

Winter mechanical pruning on cv. Garnacha «en vaso» trained fourth
year results (1987)a

Poda mecânica invernal da cv. Garnacha conduzida «em vaso».
Resultados do 4.º ano (1987)a

Type of pruning	Dormant buds per vine (N.)	Sproting buds per vine (N) > 15 cm (%)		Yield per vine (kg)	Must soluble solids (%)	Total acidity (g/l tar.)	pH
Manual	17,5(A)	23,8(A)	136(A)	2,11(A)	19,10(A)	6,51(A)	3,03(A)
Mechanical	57,3(B)	40,0(B)	70(B)	2,98(A)	18,85(A)	6,26(A)	3,09(A)

Values with unequal letter differ significantly AT P = 0,05

TABLE 4

Winter mechanical pruning on cv. Garnacha «en vaso» trained fourth
year results (1987)b

Poda mecânica invernal da cv. Garnacha conduzida «em vaso».
Resultados do 4.º ano (1987)b

Type of pruning	Clusters per vine (N.)	Clusters weight (G)	Berries per cluster (N)	Berry weight (G)	Pruning weight per vine (G)	Shoot weight (G)	Shoot length (C.M.)	F/V
Manual	22,0(A)	95,9(A)	49,81(A)	1,925(A)	636(A)	27,3(A)	67,3(A)	3,31(A)
Mechanical	39,1(B)	76,09(B)	36,97(B)	2,058(B)	418(A)	10,1(B)	42,2(B)	7,12(B)

Values with unequal letter differ significantly AT P = 0,05

The results concerning to these two years experiment are summarized in Tables 5 and 6 using indexes referred to the control (manual pruning = 100).

TABLE 5

Winter mechanical pruning on cv. Garnacha «en vaso» trained experiments third and fourth years

Poda mecânica invernal da cv. Garnacha conduzida «em vaso».
Resultados do 3.º e 4.º anos

	Indexes Referred to the control (manual pruning = 100)						
	Dormant buds per vine	Sprouting buds per vine		Yield per vine	Must soluble solids	Total acidity	pH
		N > 15 cm	%				
Third year	350	240	69	154	94	96	99
Fourth year	327	168	51	141	96	96	101
Mean	338	204	60	147	96	96	100

TABLE 6

Winter mechanical pruning on cv. Garnacha «en vaso» trained experiments third and fourth years

Poda mecânica invernal da cv. Garnacha conduzida «em vaso».
Resultados do 3.º e 4.º anos

	Indexes referred to the control (manual pruning = 100)							
	Clusters per vine	Cluster weight	Berries per cluster	Berry weight	Pruning weight per vine	Shoot weight	Shoot lought	F/V
Third year	216	70	79	88	66	38	58	233
Fourth year	178	79	74	106	66	37	63	215
Mean	197	74	76	97	66	37	60	224

These results show that mechanical pruned vines have 3,4 times more dormant buds than hand pruned vines but the number of shoots is only twice more, due to the lower sprouting (60 %). Yield is 1,5 times more and differences in soluble solids, pH and total acidity are minor. The number of clusters is twice

more but this clusters are smaller (74 % cluster weight and 76 % berries number) than manual pruned vine.

Respect to vegetative growth mechanical pruned vines have smaller pruning weight (66 %) because their shoots are very much smaller (37 % shoot weight and 60 % shoot lenght) than the control.

The relation F/V ($F/V = 8,5$) is 2,2 times bigger than hand pruned vines but still lower than the value 10, considered to give overcropping symptoms.

The results concerning to the fifth year from the begining of the experiment are shown in Tables 7 and 8. The high dispoibility of water in sping (1.988) gave a bigger pruning weight per wine and smaller relation F/V.

TABLE 7

Winter mechanical pruning on cv. Garnacha «en vaso» trained fifth year results (1988)a

Poda mecânica invernal da cv. Garnacha conduzida «em vaso». Resultados do 5.º ano (1988)a

Type of pruning	Sprouting buos per vine N > 15 cm	Yield per vine (kg)	Must soluble solids (%)	Total acidity (g/l tar.)	pH
Manual	13,5	1,36	18,5	7,57	3,16
Mechanical	35,8	1,76	21,3	9,0	3,13

TABLE 8

Winter mechanical pruning on cv. Garnacha «en vaso» trained fifth year results (1988)b

Poda mecânica invernal da cv. Garnacha conduzida «em vaso». Resultados do 5.º ano (1988)b

Type of pruning	Clusters per vine (N)	Cluster weight (G)	Berries per cluster (N)	Berry weight (G)	Pruning weight per vine (G)	Shoot weight (G)	F/V
Manual	23,0	59,13	27,89	2,12	775	57,4	1,75
Mechanical	38,8	45,36	21,03	2,15	933	26,0	1,88

We can see, like in third and fourth year results a very big self-regulation capacity.

CONCLUSIONS

Although this preliminary experiment hasn't enough entity to extract a final judgement on the performance of mechanical pruned vines a significant trend is emerged concerning to the behaviour of the plant.

Like other autors (Intrieri and Silvestroni, 1983; Clingeleffer, 1984) we find that while a definite number of buds per vine is always considered a critical factor for the hand pruned vines, the bud number per vine is not so critical when a standardized method of mechanical pruning is applied for more than one year.

The self-regulation mechanism of the vine seems to be very important and we need further studies about their possibilities in different viticultural ecosystems.

Maintaining the yield and the grape quality at a level comparable with the hand pruned vines, mechanical pruning has many possibilities to be successfully applied in different situations of spanish viticulture.

RESUMO

Resposta da vinha a cinco anos de poda mecânica simulada

O principal obstáculo à introdução da poda mecânica ainda não chegou à viticultura espanhola.

Embora sejam necessários mais estudos, as primeiras experiências de poda mecânica simulada da cultivar Garnacha na Rioja Alta, levadas a cabo durante 5 anos, parecem indicar que a poda mecânica tem muitas possibilidades de ser aplicada com êxito às diferentes situações da viticultura espanhola.

RÉSUMÉ

Réponse de la vigne a cinq années de taille mécanique simulée

Le principal obstacle à l'introduction de la taille mécanique en Espagne c'est que la récolte mécanique n'est pas adoptée par la viticulture espagnole.

Quoique d'autres essais soient nécessaires, les premiers essais de taille mécanique simulée sur cv. Garnacha en Rioja Alta pendant cinq années semblent indiquer que la taille mécanique peut être utilisée avec succès dans les différentes situations de la viticulture espagnole.

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