



# **5<sup>th</sup> International Table Grape Symposium**

**Stellenbosch, South Africa**

**21 – 23 November 2007**

# Effect of a polyethylene retractile cover on *Vitis vinifera* Thompson Seedless cv in the final condition before rain events at pre-harvest

Soza, J.A.<sup>(1)</sup>; San Juan, F.<sup>(2)</sup>; Valdivieso, V.<sup>(3)</sup> y Undurraga, P.<sup>(4)</sup>

- (1) Agronomist - Viticulturist, University of Chile. Professor of Viticulture, Faculty of Agronomy, Pontificia Catholic University of Valparaíso. Chile.
- (2) Workshop Student, Faculty of Agronomy Pontificia Catholic University of Valparaíso.
- (3) Agronomist - Viticulturist. Pontificia Catholic University of Valparaíso. Professor of Viticulture, Faculty of Agronomy, Pontificia Catholic University of Valparaíso. Chile.
- (4) Agronomist. Pontificia Catholic University of Chile, Dean of Faculty of Agronomy, Pontificia Catholic University of Valparaíso. Professor of Biotechnology of Postharvest Class and Control of Overgrowths in the same University.

---

## Abstract

Table grape is one the cultivated crop of greater importance at world level, and Chile with approximately 55,000 ha appears as the main exporter country of this product. Many fruit condition problems, associated mainly to rains at pre-harvest periods, especially affect the late season grapes production areas in Chile. Therefore, a trial was carried out on table grape Thompson Seedless cv, to evaluate fruit quality effects and condition on protected clusters to rain under the cover. Plants with and without protecting cover were considered (retractile polyethylene structure), which is only used under adverse climatic conditions like summer rains. A significant difference was observed between the two treatments at harvesting time and at post-harvest measure (30 and 50 days period). The retractile cover had total incidence with a reduced the rotting and cracking presence at harvest time and reduced the rotting presence at post-harvest in table grape Thompson Seedless cv.

**Key words:** *Vitis vinifera*, retractile protecting cover, Thompson Seedless, rotting, cracking, rain.

## 1. Introduction

Table grape (*Vitis vinifera* L.) it is one of the most important fruit crop in the world, and the main fruit crop grown in Chile with about 55,000 ha, contributing with 60% of the external offer of the south hemisphere. Thompson Seedless is the main variety in Chile exported to the USA and Europe (ODEPA, 2006).

One of the export and commercialization limitations of the Chilean table grape is produced by rotting, caused by diverse fungi. These pathological problems have acquired greater importance due to need of keeping it for long time before its commercialization. In Chile, several rotting

organisms have been described in this fruit crop, among them: *Botrytis cinerea* Pers., *Rhizopus stolonifer* (Fr.) Lind., *Aspergillus niger* Van Tiegh, *Alternaria alternata* (Fr.) Keissl., *Cladosporium cladosporoides* (Fr.) former of Vries, *C. herbarum* (Pers.) Lk., *Mucor racemosus* Fres., and *Penicillium expansum* (Lk.) Thom (Mujica and Vergara, 1980; Latorre et al, 2002a; Latorre et al, 2002b; Pszczolkowski et al, 2001). Many factors intervene in the production of quality and good condition grapes, among them a very important factor is the rainfall causing serious fruit condition problems associated to rotting and cracking (Ministry of Agriculture of Brazil, 2005).

In Chilean trials conducted in the 2000-2001 season on Thompson Seedless, it is assumed that the loss of berry strength at 60 days of cold storage, it could be due to rainfall at the end of February. This noticeable affected the grape variety Thompson Seedless condition in the whole country, with a great cracking incidence (Gurovich and Herrera, 2001).

According to The Ministry of Agriculture of Brazil (2005) the use of plastic on table grape, acts as temporary barrier of free water, hail and wind. This same organism claim that, the protective plastic used on wine vine Riesling cv diminished the *Botrytis cinerea* rot, compare to its control without plastic covering.

Different plastic materials can be used to cover the vines, according to Helguero (2007) an alternative is the polyethylene use, that is a simple polymer and of high world production, which is obtained by the ethylene polymerization. There are two types, the LDPE (low density polyethylene) and the HDPE (high density polyethylene). The first ones are material of low density, non toxic, flexible, transparent, inert, and impermeable and of low costs. The HDPE presents a high density and resistance to low temperatures, of higher durability, impermeable, opaque, inert, non toxic and of higher cost.

## 2. Materials and Method

This research study was carried out in the 2006/2007 season in Santa Margarita Farm, San Francisco de Mostazal, (33° 59' 13.18" South, 70° 40' 12.32" West) Cachapoal County, VI Region, Chile. A mature parronal of similar plant characteristic and edaphoclimatic conditions was chosen. The variety Thompson Seedless of 10 years of age was used, selecting 36 plants per treatment. Two treatments were applied: a Control treatment without cover and a treatment with retractile cover. The trellis system used was a horizontal structure named "Parronal Español" with a planting distance of 3.5 x 3.0 m with one line of drip irrigation system.

A trial was conducted consisting on the design and installation of a polyethylene retractile cover of high density (HDPE) on table grape vine (parronal), versus a control without cover. Impregnated wooden posts of 7 inches thickness and 5 m length for supporting the system, then a steel wire (17/15 thickness) was installed which together with galvanized steel rings, plastic pins, steel cables and pulleys allow the installation and retractile movement of the plastic cover.

The fruit was harvested and packed in 8.2 kg net boxes with the same standard exported packing materials. For post-harvest measurement the normal instrumentation was used to carry out the evaluations.

The parronal was standardized regarding its fruit-bearing load (thinning of clusters), until obtaining 36 clusters per plant.

There was 18 mm rainfall at the place of the trail, in February 16, 2007, in the middle of the Chilean summer, when the fruit was at the last maturing period. Therefore, the parronal was rapidly covered few hours before the rain with the polyethylene cover (HDPE). The design structure resisted the climatic event without problem and the grape was and the grape did not get wet.

Harvesting was conducted in all plants of the trail, choosing 100 clusters at random, from both treatments respectively, which were studied and evaluated. Harvesting was made ten days after the fruit reached 16.5° Brix soluble solids average, optimum according to Reynier (1995). Harvesting was done February 28, 12 days after the rain.

Three evaluations dates were carried out, one at harvesting, where the 100 clusters were evaluated, another 30 days after harvesting where 50 of those clusters were evaluated and, a last one 50 days after harvesting, where the rest of the clusters were evaluated. In each one of these measures, rotting and natural cracking were evaluated.

Rotting and cracking were evaluated, by total weight differences between the cluster and berries which presented the problem.

Results were in a percent weight base. For this a precision scale MK was used with a precision of + - 1 gr with a capacity of 5,000 gr.

For post-harvest evaluations the fruit was baled in 8.2 kg net boxes. Then an application of sulfurous anhydride gas was done injecting 30 cc per box with Dosigas equipment. After this, the boxes were pre-cooled in a force air tunnel for 12 hours to reach 0° C in the grape pulp, and they were storage in a cold storage at 0° C and 95% (+-5) R.H.

Before each post-harvest evaluation fruit temperature was raised to 4.5° C simulating the Methyl Bromide fumigation at destination

The trial was conducted by pair comparison, simple ANOVA, using the Student test "t" ( $p \leq 0.05$ ). The experimental unit was the cluster and 50 repetitions were carried out.

### 3. Results and discussion

**Rotting.** A significant difference was observed between the two treatments at harvesting time. The retractile cover had total incidence with a reduced rotting presence in table grape Thompson Seedless cv (table 1).

Evaluation in the second evaluation at 30 days of storage (table 2) and in the third evaluation at 50 days of storage, a significant differences were observed in both evaluations in berries rotting reduction in the protected sector with the cover (table 3).

**Table 1.** Effect of the plastic retractile cover on the condition parameter for rotting. Measured at harvesting.

Treatment	Percent Rotting loss (%)
With plastic cover	0.03 a
Without plastic cover	4.80 b

According to the Student-T test ( $p \leq 0.05$ ), different letters indicate significant differences.

**Table 2.** Effect of the retractile plastic cover on the rotting condition parameter. Measured at 30 days after harvesting.

Treatment	Percent Rotting loss (%)
With plastic cover	1.00 d
Without plastic cover	2.20 g

According to the Student-T test ( $p \leq 0.05$ ), different letters indicate significant differences.

**Table 3.** Effect of the retractile plastic cover on the rotting condition parameter. Measured at 50 days after harvesting.

Treatment	Percent Rotting loss (%)
With plastic cover	1.00 k
Without plastic cover	2.10 l

According to the Student-T test ( $p \leq 0.05$ ), different letters indicate significant differences.

**Cracking.** In the cracking evaluation, there was only a significant difference at harvesting, where berries under plastic presented less cracking than those without cover (table 4). In the other evaluations there was not cracking (table 5 and 6) this was due to an exhaustive cleaning at harvesting day of cracking berries.

The penetration of water through the fruit skin induces the separation of the cellular wall cuticle from the epidermis, causing a swell between both structures, which finally produces a generation of fractures.

**Table 4.** Effect of the retractile plastic cover on berry cracking. Harvesting measure.

Treatment	Percent Berry Cracking loss (%)
With plastic cover	0.78 e
Without plastic cover	4.60 f

According to the Student-T test ( $p \leq 0.05$ ), different letters indicate significant differences.

**Table 5.** Effect of the retractile plastic cover on berries' natural cracking. Post-harvest measure (30 days after harvesting).

Treatment	Percent Berry Cracking loss (%)
With plastic cover	0.0 j
Without plastic cover	0.0 j

According to the Student-T test ( $p \leq 0.05$ ), different letters indicate significant differences.

**Table 6.** Effect of the retractile plastic cover on berries' natural cracking. Post-harvest measure (50 days after harvesting).

Treatment	Percent Berry Cracking loss (%)
With plastic cover	0.0 o
Without plastic cover	0.0 o

According to the Student-T test ( $p \leq 0.05$ ), different letters indicate significant differences.

#### 4. Conclusions

The retractile plastic cover had a positive effect due to less rotting percentage at the harvesting period on Thompson Seedless grape variety. Significant differences respect to the Control without cover was observed.

The retractile plastic cover had a favorable effect due to a reduced cracking percentage at harvesting on the Thompson Seedless grape variety. Observing significant differences regard to the Control without cover.

Treatments at cold storage packed in 8.2 net kg boxes for export, evaluated at 30 and 50 days. The retractile plastic cover had a positive effect due to less rotting percentage evaluated at 30 and 50 days period on Thompson Seedless grape variety. Significant differences respect to the Control without cover was observed.

#### 5. References

- Camilo, J y Ayala, 2001. M. Partidura en cerezas la alternativa del techado. Editorial Universidad Católica. Número 31 Santiago Chile.
- Gurovich, L.A. y Herrera, B. 2001. Calidad de la uva de mesa con incrementos artificiales de la salinidad del agua de riego. Departamento de Fruticultura y Enología, Facultad de Agronomía. Pontificia Universidad Católica de Chile. Cien. Inv. Agr. 28 (3):131-143 p.
- Latorre, B., Franck, J., Zoffoli, J y Viertel, S. 2002b. Pudrición Acida de la Vid. Revista Frutícola (Chile) 23: 53-58.
- Latorre, B., Viertel, S and Spadaro, I. 2002a. Severe outbreaks of bunch rots caused by *Rhizopus stolonifer* and *Aspergillus niger* on table grapes in Chile. Plant Disease 86: 815.
- Ministerio de Agricultura de Brasil. 2005. Fruteiras temperadas em cultivo protegido – desafios e perspectivas em videira e macieira. (serial on CD-rom).
- Mujica, F y Vergara, C. 1980. Flora Fungosa Chilena. Editorial Universitaria, Santiago, Chile. 307pp.
- Oficina de políticas Agrarias (ODEPA) 2006. Superficie de frutales en Chile. [www.odepa.cl](http://www.odepa.cl). on line.
- Pszczolkowski, Ph., Latorre, B y Ceppi, di Lecho, C. 2001. Efecto de los mohos presentes en uvas cosechadas tardíamente sobre la calidad de los mostos y vinos Cabernet sauvignon. Ciencia e Investigación Agraria (Chile) 28: 157-163p.