

THE PROBLEM OF SAWDUST STICKING TO STEMS IN EXPORT GRAPE PACKAGES

The addition of water to sawdust, necessary for rapid cooling, has the additional benefit of reducing moisture loss from the fruit. Too much moisture results in increase of mold and in sticking of sawdust to the stems, particularly the capstems. Such sawdust particles are unsightly and therefore undesirable.

When export fruit is packed in chests filled with sawdust, moisture moves from the fruit to the sawdust until a state of equilibrium exists. Reaching such a state requires a month to six weeks under storage conditions. At this time, the moisture content of the sawdust will be in the range of 17-20 per cent expressed on a wet weight basis.¹ Assuming the normal sawdust moisture content at packing of 11 1/2 per cent, about a half pound of water has moved from the fruit to the sawdust. Such losses are reflected in poorer fruit quality in respect to stem drying and softer berries as well as the actual net weight loss.

Raising the moisture content of the sawdust at the time of packing much above 11 1/2 results in the two problems previously mentioned. Under magnification the sawdust particles can be observed to be attached to the stems and to each other with fine filaments. Vigorous shaking will dislodge only a part of these particles. Even after exposure to room temperature for two or three days, most of the particles still will adhere to the stems.

In a trial run last year, sticking was shown to increase as the moisture content of the sawdust, as added to the fruit, increased and with the length of the storage period.

¹ All moisture percentages are expressed on wet weight basis.

Since a higher moisture content at packing would be desirable if problems of sticking and mold could be avoided, fruit and sawdust treatments were devised in an effort to alleviate these difficulties.

Trial I

In this preliminary trial, four pound samples of fresh Emperors were placed in polyethylene bags on October 5. The sawdust added to the bags had been adjusted to a moisture content of 20 per cent. The captan or bisulfite was thoroughly mixed with the sawdust before adding it to the fruit. Following the Purex or captan fruit treatments, the grapes were allowed to dry before packing.

The fruit was examined on October 31 after 26 days cold storage. The following summary shows the estimates of the per cent of stems with sawdust adhering to them and comments.

Treatment, October 5	Amount per 10 lbs. Sawdust	% of Stems with Sawdust Sticking Oct. 31	Comments
1. Check		60	
<u>Fruit Treatment</u>			
2. Immersed in Purex 1-10, 5 min		15	Polished
3. Immersed in Purex 1-10, 10 min		10	Polished
4. Dipped in Captan 50 W, 2#/100		35	Polished
5. Dipped in Captan 50 W, 4#/100		3	Polished
<u>Sawdust Treatment</u>			
6. Captan 50 Wettable	11 grams	20	
7. Captan 50 Wettable	23 grams	10	
8. Captan 50 Wettable	45 grams	3	
9. Sodium bisulfite	19 grams	1	No bleaching
10. Sodium bisulfite	38 grams	0	Slight bleaching
11. Sodium bisulfite	76 grams	0	Severe bleaching

Trial II

Ten pound samples of Emperor grapes were harvested on November 7 and packed in three pounds of cooled sawdust in plastic bags.

On December 12 each sample was examined with results as follows:

Treatment, November 7	Amount per 10 lbs. of Sawdust	Moisture of Sawdust	% of Stems with Sawdust Sticking Dec. 12	Comments
1. Check		13%	10	
2. Check		16 1/2%	24	
3. Sodium bisulfite	10 grams	16 1/2%	1	No bleaching
4. Sodium bisulfite	20 grams	16 1/2%	0	Very slight bleaching
5. Sodium bisulfite	30 grams	16 1/2%	0	Moderate bleaching
6. Sodium bisulfite	40 grams	16 1/2%	0	Severe bleaching
7. Sodium bisulfite	50 grams	16 1/2%	0	Severe bleaching
8. Captan 50% wettable	45 grams	16 1/2%	6	
9. Captan 50% wettable	90 grams	16 1/2%	1	Dusty

The amount of sawdust adhering to the stems varies considerably from cluster to cluster. In treatment 2, for example, estimates of percentage sticking varied from 5 to 70% for the 11 clusters involved.

The amount of bleaching with the sodium bisulfite treatments was noted both immediately and after two days exposure to room temperature. No increase in sulfur dioxide damage could be noted, although the bleached berries showed more evidence of moisture loss. It seemed that the odor of sulfur dioxide could be detected in the sawdust with the 30 gram rate of bisulfite and above.

Trial III

In a final trial, four chests of fresh fruit were harvested on November 15 and placed in cold storage for a day before the sawdust

was added. The fruit in this trial, as in previous trials, was not fumigated. The eight pounds of sawdust added to each chest on November 16 contained 17 1/2% moisture. Results were as follows after five weeks of storage:

Treatment, November 16	Amount per 10 lbs. Sawdust	% of Stems With Sawdust Sticking Dec. 20	Comments
1. Sodium bisulfite, sprinkled on top	6 1/4 grams	33	
2. Sodium bisulfite, mixed	10 grams	4.7	
3. Sodium bisulfite, mixed	15 grams	1.0	
4. Sodium bisulfite, mixed	20 grams	5.9	Slight bleaching

Treatment 1 is the standard commercial treatment used in most packing houses. Sodium bisulfite at a rate of 5 grams per chest is sprinkled on top of the sawdust, or sometimes dumped in one spot. In the remainder of the treatments, higher amounts of bisulfite were well mixed with the sawdust before adding the sawdust to the fruit.

The results are in general agreement with the previous trial except for the last treatment. The sawdust and bisulfite were mixed four pounds at a time, and by mistake the last four pounds was added to the fruit without the bisulfite being added. The mistake was discovered before the fruit was placed in storage and rectified by taking all the sawdust out and mixing in the remaining bisulfite, but perhaps the distribution wasn't even. Such a reversal is not unexpected in any case, especially using only one replication per treatment.

The Cause of Sticking

Samples of grapes stems from trials 2 and 3 which had sawdust particles adhering to them were sent to Dr. William B. Hewitt, Dept.

of Plant Pathology, Davis. He isolated the three fungi Alternaria, Penicillium, and Botrytis from these stems. The filaments observed binding the sawdust particles to the stems and to each other are therefore the mycelia of these fungi.

Conclusion

This preliminary evidence suggests that sawdust with a moisture content of 17-20 per cent may be used for packing export grapes if sodium bisulfite is well mixed with the sawdust at the rate of about 15 grams per 10 pounds. Sticking of sawdust to the stems was well controlled by sodium bisulfite additions although higher rates produced damage in the form of bleaching.

The sticking was found to be caused by three species of fungi. Presumably, the problems of increased fruit molds in moist sawdust encountered in previous trials would be controlled by the same treatment although no data was obtained in this respect.