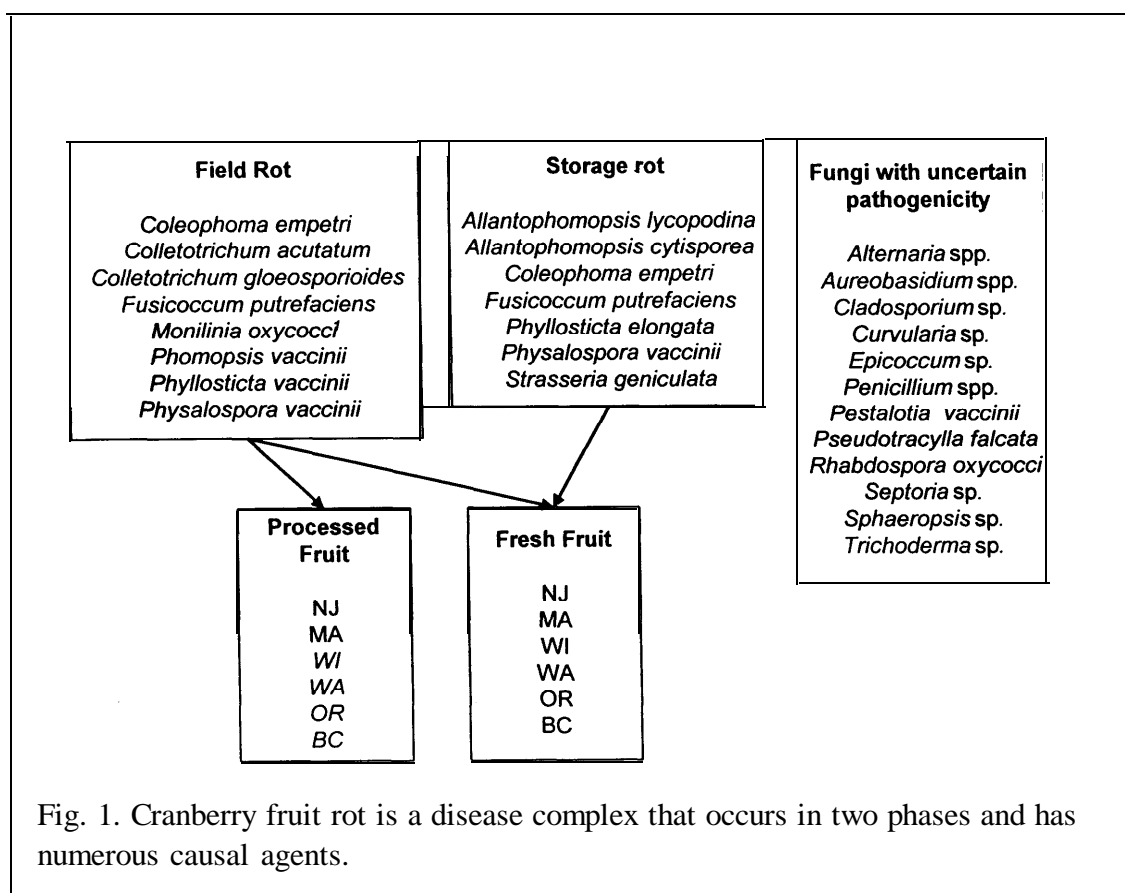


Cranberry Fruit Rot

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Cranberry fruit rot is a disease complex caused by over fifteen different fungal species. The disease is generally divided into two distinct categories: field rot and storage rot. The field rot phase is expressed pre-harvest and constitutes a major component of direct crop loss. Storage rots cause a reduction in the quality and shelf life of fresh, refrigerated fruit. There is overlap among the fungi causing field and storage fruit rots however, there are also fungal species unique to each type. In fungicide efficacy trials, the incidence of field rot is not always correlated with the incidence of storage rot. The management practices for the two phases of the disease differ, and fruit destined for the fresh market is typically harvested and handled in a manner that minimizes storage rot.



Field rot is a major threat to cranberry production, especially New Jersey and Massachusetts where, if left uncontrolled, may cause crop losses in excess of 50%. The most effective control measures rely on nonselective, protectant fungicides including ferbam, mancozeb, and chlorothalonil. In a typical commercial setting, four to five fungicide applications are made during the growing season and resultant field rot levels range from <1 - 15%. Currently, fungicide applications begin during early bloom (June 1 - 15 in New Jersey) and are repeated on a ten to fourteen-day schedule. Field-rotting

fungi are believed to infect early in the growing season and remain latent until the fruit begin to ripen. One exception is the fungus *Phyllosticta vaccinii*, which causes an early fruit rot as well as a variety of other symptoms including leaf drop and blossom blight.

The timing of fruit infections that lead to fruit rot show considerable variation depending on the fungal species in question. I will focus on field rot for the remainder of this discussion. In field experiments conducted over three years the timing of fungal

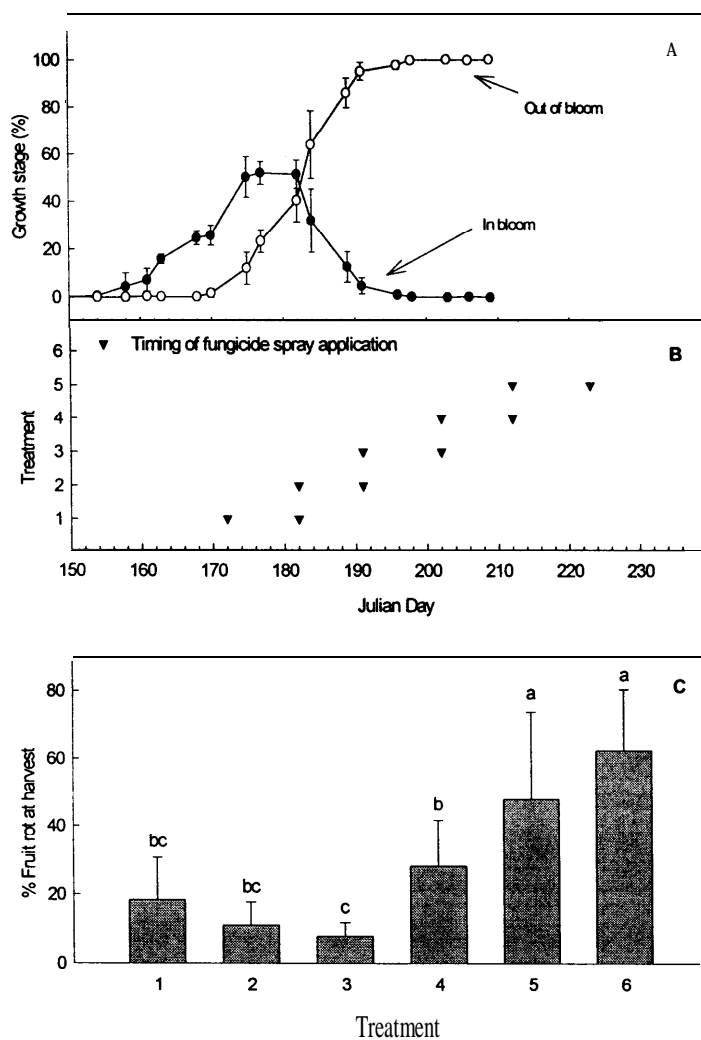


Fig. 2. Results of an experiment demonstrating the effect of fungicide timing on fruit rot control. A) Represents the phenology of the cranberry crop. In bloom and out of bloom represent the stages of flower development. B) Shows the timing of fungicide applications. Treatments (Y-axis) each included two applications of chlorothalonil and were staggered at 10-12 day intervals. C) Levels of fruit rot observed at harvest. Treatments (X-axis) correspond with treatments (y-axis) in panel B. Treatment 6 is the control and no fungicides were applied.

infections leading to fruit rot (in New Jersey) was found to be concentrated around the period immediately following bloom (Fig. 2). Fungicide applications initiated during early fruit set, which corresponds to late bloom showed the greatest efficacy. Treatments initiated after this time showed progressively less effect on disease control. These results suggest that infection must occur within a short window of time in order for fruit rot to occur. Infections occurring later have less chance of developing into field rot, however, those infections may result in storage rot. Based on these results the effect of delaying

fungicide applications will, after a certain point, result in a loss of control. Fig. 3 shows the relationship between the delay of fungicide applications and level of fruit rot control. This emphasizes the importance of timely applications for maximum benefit.

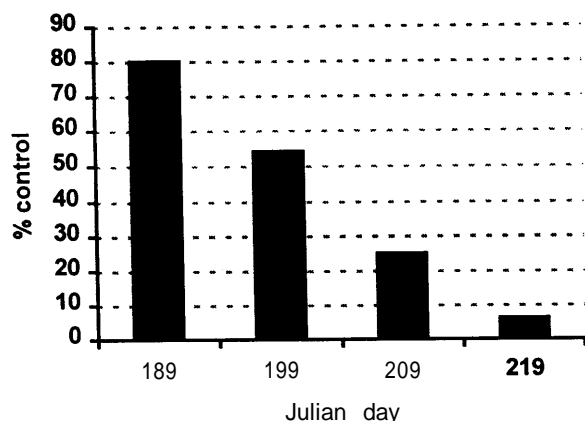


Fig. 3. Effect of delaying fungicide applications on the level of fruit rot control. Applications initiated on day 189 provided nearly 80% control whereas applications initiated on day 219 gave less than 10% control.

- Infection leading to fruit rot occurs during a 20 to 30-day period beginning at fruit set.
- Infections may occur following this period, however, do not lead to field rot.
- Fungicide applications should begin during fruit set.
- Delay of initial applications will permit greater levels of fruit rot to develop

Fungicides. Fungicides useful for controlling fruit rot are listed in Table 1. These fungicides are registered, however, in planning a fruit rot management program one should always observe the preharvest intervals as well as recommendations made by a particular handler. The fungicides chlorothalonil and mancozeb have the greatest effect on cranberry fruit rot control. Ferbam, and copper containing compounds tend to be less effective. There is little difference among the different formulations of chlorothalonil and formulation should reflect an individual preference with regards to ease of handling, and cost.

Table 1. Fungicides effective for cranberry fruit rot control

Fungicide	Formulations	Effectiveness	Phytotoxicity
Chlorothalonil	Bravo, Terranil, and several others	Very effective under high disease pressure	At high temperatures (>90 F) blossom damage can occur. Fruit scarring has been noted
Ferbam	Ferbam	Effective	None reported. Can leave a black residue
Mancozeb	Dithane, Manzate	Very effective	Reduces color development
Copper	Champ, Kocide	Effective under low disease pressure	None reported from cranberry. Can cause scarring on fruit at high rates

Phytotoxicity. Fungicides useful for cranberry fruit rot control are broad-spectrum materials. These fungicides will damage plants if they can enter the plant cell. However, these materials are formulated such that they do not cross the cuticle and enter the cell. Therefore, mixing pesticides and use of additives should be done with caution because this can alter the characteristics of the formulation and result in phytotoxicity. In particular some of the newer insecticides being registered have additives to enhance uptake. Mixtures with those insecticides and current fungicides will result in phytotoxicity.

Two fungicides, chlorothalonil and mancozeb can cause phytotoxic effects however when used properly these effects can be minimized and fruit rot can be held in check.

Rules for avoiding phytotoxicity

- Rule 1. Chlorothalonil should be used after the majority of cranberry fruit are set.
- Rule 2. Chlorothalonil should not be used if the projected bed temperatures for that day are expected to rise above 90 F.
- Rule 3. Do not mix chlorothalonil with compounds designed to enhance uptake.
- Rule 4. Do not use mancozeb after fruit are over a 1/4 inch in diameter.