


# Chapter 29


## The Efficacy of Several Fungicides on the Development of *Colletotrichum* spp. and Strawberry Anthracnose in Morocco

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### ABSTRACT

*The aim of this study was to evaluate in vitro and in vivo the effect of four chemical fungicides, Cyprodinil (37,50%) + Fludioxonil (25%), Pyraclostrobin (26,70%) + Boscalid (6,70%), Mepanipyrim (50%) and Thiram (80%), against *Colletotrichum acutatum* and *C. gloeosporioides*, causal agents of anthracnose, one of the important plant diseases in Strawberry in Morocco. Mepanipyrim inhibited mycelial growth from 55.3 to 75% and Thiram from 68.33 to 91.66% and Cyprodinil + Fludioxonil from 93 to 100%. Similarly, Pyraclostrobin + Boscalid and Thiram showed strong inhibition of conidia production in the four *Colletotrichum* isolates tested ranging from 82.7 to 98.7% and 77 to 99.61%, respectively. Significant*

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inhibition is also observed for Cyprodinil + Fludioxonil 53.72 to 99%. In vivo, the preventive and curative treatments on the aerial parts of Camarosa strawberry plants, with the two fungicides Switch 62.5WG and Signum WG, were shown to be effective against anthracnose, reducing the symptoms of the disease relative to the control.

## INTRODUCTION

Strawberry anthracnosis, caused by the genus *Colletotrichum*, is a major threat to strawberry cultivation worldwide. Among the most frequently involved species, *Colletotrichum acutatum* and *Colletotrichum gloeosporioides* are the most dangerous because of their ability to infect various parts of the plant, including fruits, leaves, stems and crowns (Freeman, Shalev, & Maymon, 2019; Baroncelli, Sanz-Martín, Rech, & Sukno, 2021). These infections can cause significant yield losses, compromising the quality and quantity of fruit harvested (Pinto, Morais, & Queiroz, 2020).

Symptoms of strawberry anthracnosis include brown or black spots on fruit, often depressed and surrounded by a halo, and necrotic lesions on leaves and stems (El Kaissoumi, Mouden, Chliyeh, Benkirane, Ouazzani Touhami, & Douira, 2018). Warm and humid conditions promote the development and spread of these fungi, making their control particularly difficult in environments conducive to their growth (Msairi et al., 2020).

Anthracnose management is based on a combination of cultivation practices, the use of resistant varieties and the application of fungicides. However, the effectiveness of fungicides may vary depending on various factors, such as the *Colletotrichum* strain involved, environmental conditions and method of application. In addition, the emergence of fungicide resistance poses an additional challenge for producers (Baroncelli, Sanz-Martín, Rech, & Sukno, 2021).

Evaluation of the *in vitro* and *in vivo* efficacy of different fungicides on the development of *Colletotrichum* spp. and on the management of strawberry anthracnosis is done by testing a range of fungicides under controlled laboratory conditions as well as under actual culture conditions, allowing to identify the most promising treatments to limit the damage caused by this disease (Freeman, Shalev, & Maymon, 2019).

The objective of this study is to evaluate the efficacy of different fungicides *in vitro* on the growth of *Colletotrichum* spp. and *in vivo* on inoculated strawberry plants.

## MATERIAL AND METHODS

### 1- *In Vitro* Effect of Different Chemical Families on the Three Life Stages of *Colletotrichum* spp.

#### 1.1- Fungal Material

Three isolates of *Colletotrichum acutatum* were isolated from a strawberry of the Camarosa variety (Coll1), a plant stem of the Festival variety (Coll2), a plant collar of the Camarosa variety (Coll4) and an isolate of *Colletotrichum gloeosporioides* (Coll3) also isolated from plant collar of the Camarosa variety.

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