

**INCIDENCE, ISOLATION AND IDENTIFICATION OF FUNGAL SPECIES
ASSOCIATED WITH PASSION FRUITS (*PASSIFLORA EDULIS*)
CULTIVATED IN THE DSCHANG PRODUCTION BASIN**

¹*Njimah Mfonmbouot D., ²Tientcheu -Nitcheu S. D., ³Ndonkou Nfozon J.,
³Tamekou Lactmata S. and ²Fodong Djeugue C.

¹Research Unit of Applied Botany, Faculty of Science, University of
Dschang, P.O. Box 67 Dschang, Cameroon.

²Foyaguem University Institute of Dschang-Cameroon, Department of Agriculture,
P.O. Box 468, Dschang Cameroon.

³Research Unit of Microbiology and Antimicrobial Substances, Faculty of Science,
University of Dschang, P.O. Box 67 Dschang, Cameroon.

*Corresponding Author

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ABSTRACT

Species belonging to the *Passifloraceae* genus are faced with pre- and post-harvest losses in the Dschang production basin. Among the causes of these losses, fungal diseases play an important role due to lack of knowledge of the symptoms of these diseases and the fungal species associated with them. It is in this context that the present study was carried out with the aim of describing the symptoms, assessing the incidence of fungal diseases and isolating and identifying the various fungi associated with passion fruit grown in the Dschang production basin, with a view to considering an effective control method at a later date. To this end, five quadra were carried out at each production site. Each plant organ (leaves and fruit) present in each quadra was scrupulously observed for symptoms of the parasitic diseases present. Each time a symptom was observed, it was noted then name of the disease and the type of disease associated with the symptom identified. From the fungal disease symptoms observed, the incidence was determined by calculating the ratio of the number of contaminated plants per quadra to the total number of plants multiplied by one hundred. The results showed that passion fruits grown in the Dschang production basin are contaminated by several fungal diseases, as evidenced by yellowing and drying of leaves and fruits, wilting of leaves and stunting of fruits, fruits with brown spots and fruits with grey lesions. An inventory of the fungi associated with these symptoms revealed the presence of five fungal

species: *Fusarium spp* causing fusariosis, *Verticillium spp* causing Verticillium wilt, *Penicillium spp* causing blue or green rot of fruits, *Pythium spp* causing root rot, fruits rot or melting of seedlings and passion fruit wilt and *Aspergillus spp* causing aspergillosis. The five species showed different frequencies of occurrence. *Fusarium spp* was the most frequent and had a cottony appearance with a white underside of the petri dish. Similarly, this species had the largest growth diameter in the PDA culture medium (8cm) compared with *Pythium spp*, which had a relatively small growth diameter (7.5cm). The incidence showed that although there were significant differences in the different organs of *Passiflora edulis* according to Duncan's 5% test, all the plants in the different quadrats showed a fungal disease incidence rate of 100%. Now that the symptoms of passion fruit fungi are known, as well as the fungal species responsible for these symptoms, it will be wise to develop an effective control strategy against the various species isolated and identified in the near future.

Keywords: Symptoms, incidence, fungal diseases, *Passiflora edulis*

INTRODUCTION

Passionflower (*Passiflora edulis*) is a perennial plant native to South America, more specifically the lowlands of tropical Brazil, belonging to the Passifloraceae family. It is widely cultivated in tropical and subtropical climates for its nutritional, economic and therapeutic value. Passion fruit is rich in nutrients such as minerals and vitamins A, C and D. The fruit is eaten fresh, processed into juice or syrup, on its own or mixed with the juice of other fruits, in ice cream, cocktails or pastries. Boiled *Passiflora* leaves are also used to treat insomnia, overwork and malaria (Amata *et al.*, 2009). Passion fruit production is constantly increasing around the world. Production rose from 540,000 tonnes in 2013 to 690,036 tonnes in 2020 (James Mwangi, 2025). This increase in passion fruits production is justified not only by its role in food and medicine, but also by its economic importance, as it is a source of foreign currency for many producer countries around the world. In Cameroon, the ideal agro-climatic conditions for growing this fruit and its economic potential have encouraged farmers to embark on this production, which has subsequently led to an increase in the area under cultivation. But despite all these factors and the increase in the area under cultivation, world production is not always able to meet local demand. One of the causes of this dissatisfaction may be due to diseases and pests, which cause huge losses for farmers. Olanya *et al.* (2001) found that several diseases were responsible for passion fruit losses estimated at 24.8 million dollars a year. Among the diseases associated with these losses, fungal diseases are the most important, as they can cause yield losses of up to 80% of production (Amata *et al.*, 2009). While a few fungal diseases have been reported on passion fruit elsewhere, in Cameroon, particularly in the Dschang production basin in the west, people seem to be unfamiliar with the symptoms of the various fungal diseases responsible for the deterioration of these fruits, and how they develop in the field. It would be wise to know the symptoms of the fungal diseases affecting this crop, their epidemiology and

the fungal species associated with them, so as to consider an effective control method in the future and ensure food stability, security and self-sufficiency in the long term. It was with this in mind that the present study was initiated, with the aim of reducing pre-harvest losses of passion fruits (*Passiflora edulis*) due to fungal contamination.

MATERIALS AND METHODS

Determination of symptoms of various fungal diseases associated with passion fruit

In each collection site, five quadra were drawn from north to south, east to west and the last one in the centre. Each plant organ (leaves, stems and fruit) present in each quadra was scrupulously observed for symptoms of the physiological or parasitic diseases present. Each time a symptom was observed, it was noted, the name of the disease and the type of disease associated with the symptom identified.

Evaluation of the incidence of fungal diseases among other diseases observed in the field

The incidence of the various fungal diseases observed on passion fruits grown in the Dschang production basin was assessed on the basis of previously identified symptoms. The incidence of fungal diseases of passion fruits was assessed in a field located in Litakli. In the selected collection field, five quadra were drawn from north to south, east and west and one in the centre. In each quadra, the total number of plants was recorded. Each plant was then carefully examined for fungal disease symptoms. The number of plants showing each symptom was noted at each collection site and for each crop, and the incidence of each symptom was calculated using the following modified formula from Njimah *et al.* (2025):

$$\text{Incidence of the disease} = \frac{\text{total number of diseased plants}}{\text{total number of plants inspected per quadra}} \times 100$$

Isolation and identification of *Passiflora edulis* fungi

Preparation of the culture medium

PDA culture medium was prepared for the isolation of the various fungi responsible of passion fruits degradation. To do this, 39.6 g of prefabricated PDA medium was measured using an adventure pro brand precision balance and then dissolved in 1 litre of warm distilled water. After dissolution, 4 BP Chloramphenicol 250 mg capsules were added to the mixture to prevent bacterial growth and the whole mixture was autoclaved at 121°C for 15 min. After sterilisation, the medium was poured into 90 mm plastic petri dishes at a rate of 20 ml per dish.

Isolation and identification

Passiflora edulis fruits, stems and leaves showing symptoms of the disease were transported to the laboratory, where they were washed separately in tap water and then superficially disinfected using cotton soaked in 95° alcohol (Wamalwa *et al.*, 2018). Fragments of necrotic tissue measuring approximately 2 mm² were removed under a microbiological hood near a Bunsen burner flame using a sterile scalpel (Djeugap *et al.*, 2015). These fragments were then disinfected in a 5% sodium hypochlorite solution for 10 minutes, rinsed 3 times in succession with distilled water to remove traces of the disinfectant and then placed on sterilised filter paper to remove excess water (Zakawa *et al.*, 2019). These fragments were aseptically seeded into 90 mm glass Petri dishes containing 20 ml of PDA medium at a rate of 5 fragments per Petri dish and placed in the dark in an incubator at a temperature of 24 ± 2°C. After daily observations, the fungal colonies visible around the inoculated fragments were picked and subcultured individually in new Petri dishes containing PDA medium. After several successive transplants, pure cultures of the different fungal isolates were obtained. The fungal species isolated were identified on the basis of the morphological characteristics of the mycelium (septate or nonseptate) and fruiting bodies (conidia) observed under an ordinary microscope, using mycological identification keys (Barnett and Hunter, 1972; Abdesselem *et al.*, 2016; Srinivas *et al.*, 2019; Lombard *et al.*, 2019, Njimah *et al.*, 2025). These observations were used to calculate the isolation frequencies (IF) of the various species according to the following formula (Keuete, 2015; Njimah *et al.*, 2021):

$$FI (\%) = \text{Number of specific species} / \text{Total number of fungi isolated} \times 100$$

Where **FI**=Frequency of isolation

After identification, the different fungal species obtained were sealed in Petri dishes with para-film paper and kept in the incubator at a temperature of 4°C.

RESULTS AND DISCUSSION

Symptoms and incidence of various fungal diseases observed in the field during the inspection visit

During our field visit, several symptoms of fungal diseases were observed on the various organs of *Passiflora edulis*. These symptoms were numerous, included leaves and fruit turning yellow, then brown and dry (Figure A), wilting leaves and stunted fruit (Figure B), fruit with brown spots (Figure C) and fruit with grey lesions (Figure D). Based on these different fungal disease symptoms, the incidence was determined and the results showed that all the passion fruit plants were contaminated, giving an incidence rate of 100%, which would justify the concern and fear of the farmer who called us. Some of the symptoms detected in the course of his work had already been reported by Amata *et al.* (2009) in their research on the incidence, prevalence and severity of fungal diseases of passion fruits in Kenya. This similarity could be justified by the presence of ubiquitous fungi in these two agro-ecological zones and also by the fact that passion fruit is a

favourable environment for their growth due to its rich nutrients. However, the differences observed could be justified by climatic differences, as Kenya, being a hotter zone with low rainfall, would not favour the growth of certain fungi, which nevertheless develop favourably in Dschang which is more or less humid. Humidity encourages the development and growth of a wide range of phytopathogenic fungi.



**Figure 1: Leaves and fruits showing symptoms of fungal diseases,
(A) Mildew; (B): Fusariosis**



**Figure 2: Fruits showing symptoms of fungal diseases
(C) Alternariosis; (B): Grey rot or Botrytis**

Table 1: Symptoms, diseases and incidence of fungal diseases of *Passiflora edulis*.

Organs	Symptoms observed	Suspected diseases	Incidence (%)
	Yellowing and drying out Leaf wilting and fruits stunting	Fusariosis	96 ^b
Fruits and leaves	Fruits with brown spots grey lesions	Mildew Grey rot	99 ^a 80 ^c
Sticks	Stems drying out	Fusariosis	65 ^d

a, b, c and d: Means with the same superscript letter in the same column are not significantly different according to Duncan's 5% test.

Inventory of fungi associated with different organs of *Passiflora edulis*

Several fungi are responsible for the degradation of *Passiflora edulis* cultivated in the Dschang production basin. These include fusarium wilt caused by *Fusarium spp.*, verticillium wilt caused

by *Verticillium spp.*, seedling blight caused by *Pythium sp.*, aspergillosis caused by *Aspergillus sp.*, and blue or green mould caused by *Penicillium spp.* *Fusarium spp.* had already been reported by Florence and John (2022) as responsible for passion fruit rot in Kenya. The presence of this fungus in both Kenyan and Cameroonian passion fruit would suggest that *Passiflora edulis* is one of the substrates conducive to the growth of this fungal species. Similarly, this fungal species had also been identified in other fruits such as tomatoes (Njimah *et al.*, 2025).

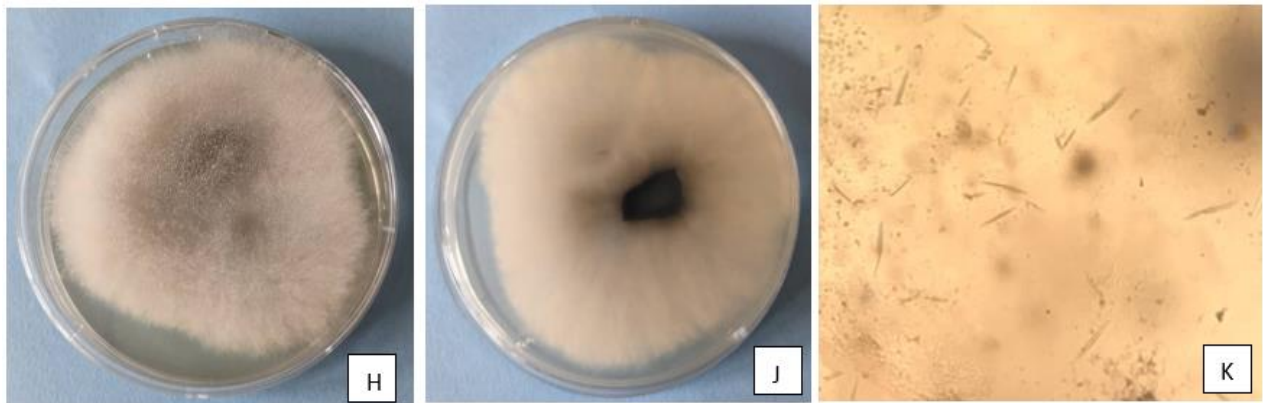


Figure 3: (E) Healthy fruits, (F) Contaminated fruits, (G) Interior of contaminated fruit, (H) Pure culture of *Fusarium sp*, (J) Reverse of Petri dish containing pure culture of *Fusarium sp*, (K) Microscopic appearance of *Fusarium sp* (macroconidia)

The five species had different occurrence frequencies. *Fusarium spp* was the most common and had a cottony appearance. The interior of the Petri dish was white. It had the largest growth diameter in the PDA culture medium. Previous studies had already shown that this fungal species grows rapidly in PDA medium compared to other species (Njimah *et al.*, 2025). Dextrose and potatoes, which are components of this medium, appear to be the primary nutrients for this fungus.

Table 2: Frequency of occurrence of fungi associated with passion fruit inspected in the Dschang production basin

Fungal species	Frequency of occurrence	Growth diameter (Cm)	Appearance of colonies	Colouring the back of the Petri dish
<i>Fusarium spp</i>	26	8	Cotton-like	White
<i>Pythium sp</i>	21	7,6	Cotton-like	White
<i>Verticillium spp</i>	10	8	Cotton-like	White
<i>Penicillium spp</i>	12	8	Cotton-like	White
<i>Aspergillus sp</i>	7	8	Cotton-like	Brown

CONCLUSION

At the end of this work whose objective was to contribute to reducing pre-harvest losses of passion fruits (*Passiflora edulis*) due to fungal contamination, it appears that: Several symptoms of fungal diseases were observed on *Passiflora edulis* fruits in the Dschang production basin during the inspection period, manifested by yellowing and drying of leaves and fruits, wilting of leaves and stunted growth of fruits, brown spots on fruits, and grey lesions. The results of the incidence assessment showed that all passion fruit plants were contaminated, representing an incidence rate of 100%. Passion fruits found in the Dschang production basin harboured a variety of fungi, the most important of which are *Fusarium spp*, *Vercillium spp*, *Penicillium spp*, *Pythium spp* and *Aspergillus spp*. The five species had different frequencies of occurrence. *Fusarium spp*. was the most common and had a cottony appearance with a whitish underside of the Petri dish. Similarly, this species had the largest growth diameter in the PDA culture medium compared to *Pythium spp.*, which had a relatively small growth diameter. As the symptoms of passion fruit fungi are known, as well as the fungal species responsible for these symptoms, this constitutes an important database that will guide farmers in their choice of fungicide without the risk of making a mistake and applying another pesticide instead. However, it would be interesting to supplement the information

obtained in this study by evaluating the effectiveness of plant extracts against previously isolated fungi as an alternative to chemical control.

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