Maestría en Ingeniería en
Diseño de Bioprocesos

Cultures in liquid and solid fermentations of entomopathogenic fungi used in biological control of plagues

Alfonso Zambrano Gómez

Eduardo Molina Gayosso

María Leticia Ramírez Castillo

VIII Symposium de Posgrado
"Visión e Innovación Politécnica"

Perform in vitro and in vivo applications of the bioinsecticide.

Cultures in liquid and solid fermentations of entomopathogenic fungi used in biological control of plagues.

Alfonso Zambrano Gómez, Eduardo Molina, María Leticia Ramírez

Master in Bioprocess Design Engineering

{bioalfon@gmail.com}

Tercer Carril del Ejido Serrano S/N, San Mateo Cuanalá, Mpio Juan C. Bonilla, Puebla, Mexico.

1. Introduction

Since the beginning of agriculture, agricultural crops have presented devastating damage by plague organisms, which cause significant damage to crops and very large economic losses, for this reason man has sought alternatives that reduce this serious problem [1]. The use of microorganisms, mainly entomopathogenic fungi for biological control of plagues has been very relevant since they tend to be selective for some species and cause disease and mortality in specific insects [2].

The objective of this research is to produce the entomopathogenic fungi penicillium and XXX through solid and liquid fermentations and to evaluate their capacities as biological control agents in Agricultural crops fields.

2. Objectives

2.1. General objective

To evaluate the effectiveness of the use of the entopathogenic fungi for the biological control of plagues in corn cultivation.

2.2. Specific objectives

- To carry out perform fermentations in solid and liquid state for the production of each fungus.
- To determine the hydrolytic enzyme activity during the fermentations solid and liquid.
- To determine the most effective form of application of the entomopathogen fungus in the corn crop.

3. Methods

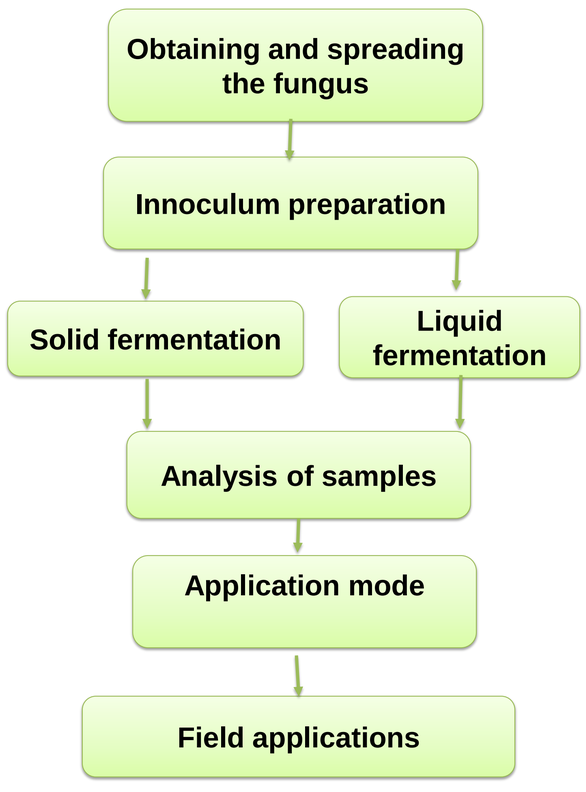
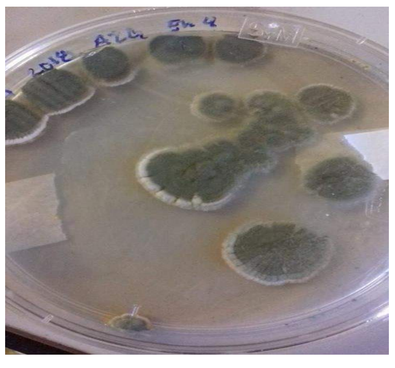


Figure 1- General methodology that will be used in this investigation.

3.1 Obtaining, propagating and identifying the fungus



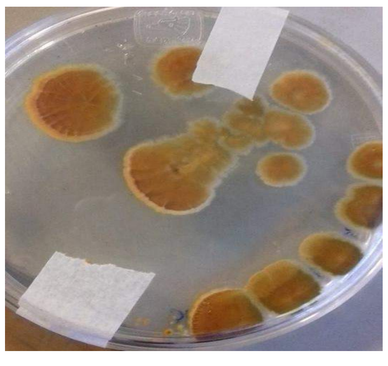


Figure 2.-A) The morphology and growth of the fungus in the upper part is shown. B) The morphology of the fungus in the lower part is appreciated.

3.2 Preparation of inoculum.

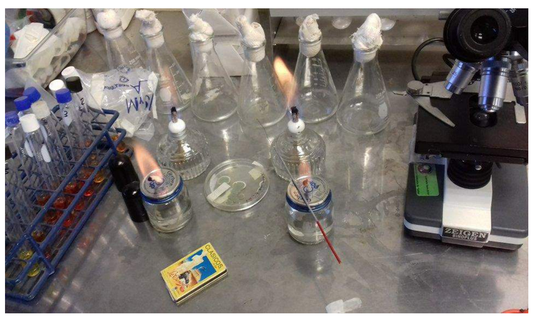


Figure 3: Preparation of the fungus to inoculate both fermenters.

3.3 Fermentation in liquid state..

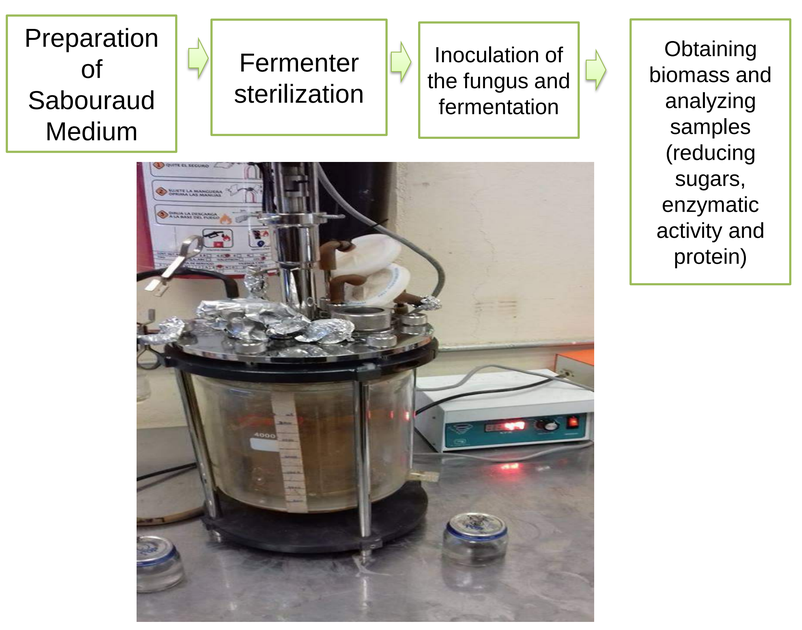
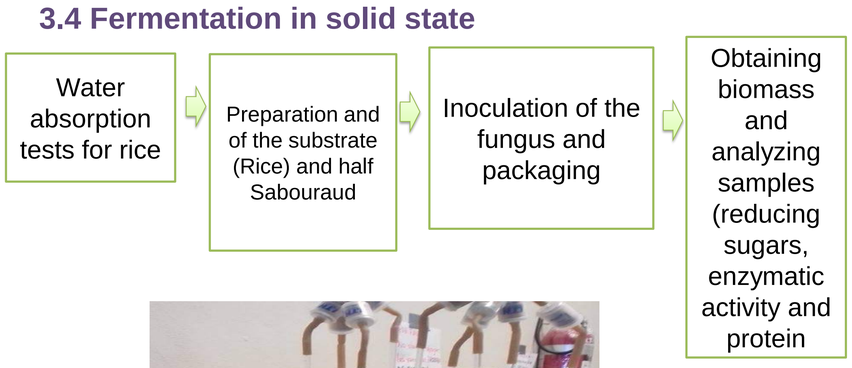


Figure 4: Fermentation in Medio liquid:

3.4 Fermentation in solid state



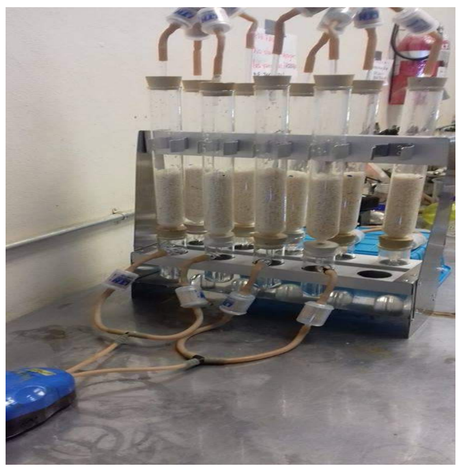


Figure 5: Fermentation in solid state.

3.5 Fermentation on a larger scale

Figure 6:Biorreactor for solid state fermentation on a large scale.

4. Results.

According to the methodology used for the identification of the microorganism, the strain employed for the fermentation has a great similarity with *Penicillium sp* fungus [3].

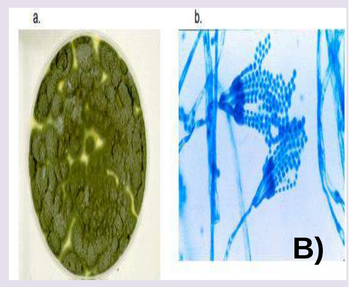


Figure 7: A) The structure of the fungus used in this research. B) picture of *Penicillium sp* fungus reported by Salfelder (2000)

Table 1 shows the kinetic parameters of 3 L fermentation in biorreactor, the biomass was collected to the end fermentation, Figure 8.

Figure 8: A) Biomass is appreciated in the medium obtained at the end of the fermentation. B) Dry biomass obtained.

Table 1. Kinetic parameters obtained in liquid fermentation.

kinetic parameters	Value
Biomass, Xf (g/l)	0.2983
Yield of biomass to subtrate Yxs (gx/gs)	0.04475
Productivity, rx (gx/lh)	0.003107

The sporulation of the fermentation in solid state can be observed after 72 hours of its onset.

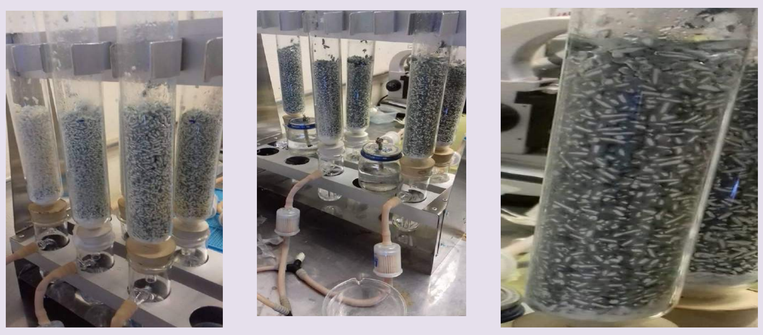


Figure 10: Evolution of solid fermentation.

5. Conclusion

The fungus used in this research presumably belongs to the specie *Penicillium* sp. The fermentation in the liquid state produced pellets and made difficult the mass transfer, causing difficulties for the sample extraction. The solid state fermentation was adequate for fungus sporulation, it was observed after three days.

Acknowledgements

To CONACYT for being scholarship holder this academic program and all people who support this project

References

[1] Carrillo, M. Blanco, A. "Potencial y Algunos de los Mecanismos de Acción de los Hongos Entomopatógenos para el control de insectos Plaga,"Universidad de Guanajuato, Mexico, 2009.

[2] Gonzales, M. Aguilar, C. Rodriguez, R. "CONTROL DE INSECTOS-PLAGAS EN LA AGRICULTURA UTILIZANDO HONGOS ENTOMOPATOGENOS:RETOS Y PERSPECTIVAS," Revista cientifica de la Universidad Autonoma de Coahuila, Mexico, 2012.

[3].Arias, E.Piñeros,P. "Aislamiento e identificación de hongos filamentosos de muestras de suelo de los paramos de guasca y cruz verde," Universidad Javeriana, Bogota, Colombia, 2008.

2018