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Occurrence of Insect Pathogenic Fungi in Some Locations within Federal University of Kashere, Gombe State, Nigeria.

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Abstracts

Insect pathogenic fungi have emerged as ideal candidates in integrated pest management (IPM). In order to exploit these entomopathogens in the control of local pests of agricultural produce, it is important to isolate and characterize indigenous strains. To this end therefore, a total of 30 soil samples were collected from 4 (four) different sites within Federal University of Kashere and assessed for the occurrence and abundance of entomopathogenic fungi following standard procedures. Morphological and colonial as well as spore characteristics were evaluated using keys. Results obtained shows occurrence of different isolates with *Fusarium sp*. being the most prevalent at site A at 35%, *Aspergillus sp*. for site B at 38%, *Aspergillus sp*. and *Fusarium sp*. at site C with 30% each while at site D *Beauveria sp*. was the most prevalent at 43% occurrence. The occurrence of these important entomopathogens in Kashere especially *Beauveria sp.* and *Meterhizium sp.* is an indication of the potential for their exploitation in the biological control of insect pests in Kashere.

Keywords: Entomopathogens, Fungi, IPM, Kashere

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Introduction

Insect pathogenic fungi are natural enemies of insect pests and arachnids. As well, they contribute immensely in the control of insect populations. These insect pathogens are also either facultative or obligate parasites of insects, which sporulate as a survival strategy (Delgado *et al.*, 2011). In agriculture therefore, a variety of fungi have been observed to cause mortality in pest populations and are being exploited and incorporated into various formulations for use in pest control (Authur and Thomas, 2000; Tanzini *et al.*,2001). For instance *Metarhizium anisopliae* and *Beauveria bassiana* are the two most effective and most exploited entomopathogenic fungi that have been used to control a number of insect pests of agricultural produce (Fan *et al*., 2007; Vega *et al*., 2008; Yakubu *et al*., 2018). Others include *Beauveria brongniartii*, and *Isaria fumosorosea* (De Faria and Wraight 2007; Kim *et al*., 2010).

Usually, fungal conidia have been traditionally employed in pest control through an inundative or inoculative biological control strategy (Eilenberg *et*

*al.,*2001). The conidia usually attach to the external cuticle of the insect. Subsequently, they germinate and penetrate the cuticle. Once inside the insect, the conidia penetrate into the hemocoel of the insect spreading their mycelium throughout the host (Scholte *et al.,* 2004). The fungi go on to produce toxins which results in host insect paralysis (Goettel and Inglis, 2001) and eventual death within 14 days of infection depending on the type of host. Under favourable conditions, hyphae may emerge from the host insect which produces conidia and are usually dispersed by wind or water (Yakubu *et al.,* 2018).

Entomopathogenic fungi have also been reported to cause epizootics in agricultural habitats with *Beauveria*, *Paecilomyces*, *Sporodinella*, *Stilbela*, *Hirsutella*, *Metarhizium* and *Erynia* mostly implicated (Inglis *et al*., 2001). The occurrence of entomopathogenic fungi in Nigeria has been reported (Yabubu *et al.,* 2018). Their findings suggest that these fungi act as mortality factors in local insect populations. However, the abundance and biodiversity of these fungi is poorly known, especially in Kashere, Gombe State. Farmers in Kashere depend heavily on the use of chemical pesticides for controlling insect pests of farm produce. These pesticides however, have been documented to pose harm to humans as well as serving as a source of contamination to drinking water sources. As well, the chemical pesticides are non-target specific therefore killing both pests and beneficial insects on the farm. A survey was therefore carried out in some areas of Federal University of Kashere to evaluate the occurrence of entomopathogenic fungi in soil samples from Federal University of Kashere.

Materials and methods

Insect pathogenic fungi were isolated from soil samples collected from different locations within the campus of Federal University of kashere. Soil samples were collected from four different locations designated A, B, C and D. Suspension of soil samples collected from each site was prepared by addition of 1 g soil into 9 ml of sterile distilled water and mixing thoroughly. Thereafter, Serial dilutions (10^{-1} to 10^{-6}) of the prepared soil suspensions were made. 1ml each of the two (10^{-5} and 10^{-6}) dilutions was poured into sterile Petri dish which was mixed with cooled Potato dextrose agar (PDA) supplemented with lactic acid to avoid bacterial growth and sterilized for 20 min at 121°C. Two replications were used for each dilution level and cultured on PDA containing 200µg/ml dodine and 50µg/ml of streptomycin (Yakubu *et al.,* 2018). The plates were sealed with Para film before incubation at 25°C for 7days.The 7 days culture was sub-cultured on PDA plates and incubated for 14 days to obtain pure isolates at 25^{o}C. The resulting colonies obtained at the end of the 14 days were identified macroscopically using insect pathogenic fungi keys as a guide (Yakubu *et al.,* 2018).

Results

A total of six fungi species were isolated and identified using keys as shown in Table 1 *Mucor sp., Aspergillus sp., Metarhizium sp., Fusarium sp., Penicillium sp., and Beauveria sp.* were identified. The isolates were also stained and identified using morphological characteristics as well as the shape and form of their spores as presented in Table 2.

Table 1: Occurrence and abundance of fungi in soil samples from selected sites in Federal University of Kashere, Gombe State.

Enthomopathogens	Prevalence (%)			
	Site A	Site B	Site C	Site D
Mucor sp.	10	10	10	5
Aspergillus sp.	15	38	30	22
Metarhizium sp.	15	13	15	22
Fusarium sp.	35	11	30	5
Penicillium sp.	10	13	15	3
Beauveria sp.	15	15	0	43

Table 2: Identification of isolates from the soil samples

Morphology	Colour	Spores	Probable fungus
Grows fast with heavy sporulation	Black or dark brown	Rough echinulated globose conidia	*Aspergillus* sp.
Grows rapidly, and wrinkled	Violet	Globose or ovoid	*Penicillium* sp.
Heavy sporangiosphores	Grey	Ovoid zygospores	*Mucor* sp.
Powdery and finally crustose	Dark herbage green	Globose conidia	*Metarhizium* sp.
Sparse to abundant mycelium, wrinkled in old cultures	white or peach with purple tinge	Oval, ellipsoidal	*Fusarium* sp.
Powdery mycelia	white or pale yellow	Clustered globular or flask shaped conidia	*Beauveria* sp.

Discussion

This study has demonstrated the possibility of obtaining local strains of entomopathogenic fungi with potential for adoption for the management of pests of farm produce in Kashere. Although the most abundant fungi found in the study area irrespective of the sources were *Aspergillus species* and *Fusarium species*, the occurrence of the other fungi of insect pathogenic or pesticidal potential such as *Metarhizium sp*. *Beauveria sp. Penicillium sp.* and *Mucor sp.* also show that they can be readily obtained locally. This suggests that insects that damage crops in kashere could be easily managed if these locally adapted strains of insect pathogens are studied and employed for pest management. This view is consistent with that of (Yabubu *et al.,* 2018). Several studies have indicated and confirmed the effectiveness of insect pathogens especially *Beauveria sp.* and *Metarhizium sp.* as effective biocontrol agents of several crop pests (Vega *et al.,* 2008; Inglis *et al.,* 2001; Yakubu *et al.,* 2018). Important entomopathogenic fungi with known potential for management of field pests of crops encountered in this study were *Beauveria sp*. and *Metarhizium sp.* however, further work would be required

to assess the effectiveness of these locally sourced potential biocontrol agents against local pests of plants under laboratory conditions.

Conclusion

This study has indicated the available indigenous fungal isolates which can be exploited for management of local pest populations in the area when properly studied. The most common entomopathogens with recorded potential for pest management encountered in this study was *Beauveria sp.* and *Metarhizium sp.* However, further work would be required to assess the effectiveness of these locally sourced potential biocontrol agents against local pests of farm produce since the area is an agrarian community.

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