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RESEARCH ARTICLE

Entomopathogenic fungi in population of Acridid grasshopper from Sindh, Pakistan

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Abstract

Extensive surveys for collection of Acridid grasshopper were carried out from different province of Pakistan during the year 2012-2013. Present study revealed a significantly high incidence of 73% when sporulation tests were carried out on grasshopper cadavers. At the present 03 species of fingi i-e *Aspergillus flavus, A. fumigutus* and *A. niger* were collected and their high infection were reported on the sixteen species i-e *Oxya velox* Fabricius, 1787; *Poekilocerus pictus* Fabricius 1775; *Oxya hyla hyla* Serville, 1831; *Hieroglyphus nigrorepletus* Bolivar, 1912; *Hieroglyphus perpolita* (Uvarov, 1932) ; *Hieroglyphus oryzivouous* Carl, 1916*; Acrida exaltata* Walker, 1859; *Phlaeoba tenebrosa* Walker, 1871; *Duroniella laticornis* Krauss, 1909; *Truxalis examia examia* Eichwald, 1830; *Truxalis grandis fitzgeraldi* Drish, 1951; *Locusta migratoria* Uvarov, 1921*; Oedipoda fadtshenkoi pamirica* Ramme, 1934; *Sphingonotus savignyi* Saussure 1884; *Sphingonotus rubecens rubecens* (Walker) 1870 and *Aiolopus thalassinus* Fabricius, 1781. These collected host grasshoppers were considered major and minor pest of many valued crops in Pakistan. Furthermore, the results were also discussed in a relation to the ecology of fungal pathogen and their possible role in management of pest in Pakistan.

Introduction

Surveys for mycopathogens of Orthoptera pest were conducted between 1990 & 1993 in Africa & Asia as a main project of biological control of grasshoppers and locust (Kooyman & Shah 1992). In this project they highlighted the world's most destructive agricultural pests, with the most damaging, the plague of migratory pest. Studies on the enzootic levels of *Aspergillus* infection in Orthoptera have received less attention in Pakistan. Besides this, subject has widely studies in world as test treatment against many pest species of Orthoptera and there are many reference are available. i-e Shah et al., 1994 & 1997; Lomer et al., 2001; Prior et al., (1995). However, such studies are necessary because they provide the indication of background of entomopathogenic infection level which should be surpassed by application of released of artificially production beside this study also give the knowledge now an entomopathogenic fungi percent between the different species of grasshopper in field.

According to Uvarov, (1977) Orthoptera species may be classified into two main groups by its reproductive strategies, micro-habitat and micro-humidity niche preferences at the present collection of such large number of species along with these infection levels of entomopathogenic will be very beneficial for the utilization of these mycopesticide against grasshopper. The basic aim of this study was also determine the natural occurring infection level of entomopathogenic fungi so that proper planning could be made possible for future. Furthermore, leading to modern insight aimed towards increasing the efficacy of mycoinsecticides as parts of IPM practices present study has been made.

Material and Methods

Survey:

For the collection of grasshopper species weekly visit of many agricultural field that include maize, sugar cane, cotton, wheat fodder crops from various provinces of Pakistan has been carried out during the year 2012-2013. In summer period mostly green houses, orchards, gardens and field were also inspected for more host species.

Collection of infected samples:

For the collection of infected insects keen observation were made in field for searching these for this only those insects were collected which having clear symptoms of mycoses with this sign insect don't move fast, change its color from original one, cuticle fully covered with fungal mycelia and they were very sluggish and found very easy to pick up. All these infected species were picking with large forceps. Collected species brought into laboratory and all were sorted out into different host species and kept in clean cages having diameter of (length 30.5cms, width 26.5cms) fresh maize leaves were provided to insects as described by Prior et at., (1995) and Riffat et al., (2013). Food plant change daily and observation has been noted which include mortality of insect after every 7 days.

Isolation of entomopathogenic fungi:

For the isolation of different entomopathogenic fungi cadavers with mycelia cushions preparations of conidia were obtained by film methods these preparation were kept on the slide and slide was colored with lactophenol cotton blue for clear view after this hyphae and conidia were studied under Stereoscopes Binocular Microscope. Shape and size of conidia were observed under the microscope for identification of fungi species.

Identification of fungal isolates:

During the present study identification of fungal isolated mainly based on this conidia shape and size and other description given by (de Hoog, 1972; Domsch, et al., 1980; IMI, 1983; Balazy, (1993) and Humber, (2012) was adopted).

Result and Discussion:

During the present study a total of 477 specimen have been collected from different ecological zone of Sindh these grasshopper having great economic important due to its geographically distribution and wide pest status (Table-I) many of them were reported as major pest of our earning crops like rice, sugar-cane, maize, wheat and cotton while other also destroying the vegetable, fruit and fodder crops as well. At the present Irshad and Stephen, (2012) reported a vast population of the grasshopper occurring is most important crops like wheat, sugarcane, rice and cotton. Which together account for more than 75% of the value of total crops output. Similarly, many fruit vegetable fodder crops, important grasses which are food items for many animal were also attacked by numerous grasshoppers species as enlisted in (Table-I). Beside this they also consider serious in causing guantitative loss of crops. Biological control is the combination of utilization of predators, parasitoids, pathogens, antagonists or competitor population to suppress a pest population, making it less abundant and less damaging than it would (Irshad and Stephen, 2012), Occurrence of entomopathogenic fungi has been shown in (Table-II) it could be suggested that used of fungi as bio-pesticide against the Orthoptera insect could be proved economically and environmentally friendly solution to reduce pest population. But unfortunately, Pakistan has been advocating this type of approach since many decades it is urgent need for the registration of this bio-pesticide against Orthoptera pest, it might be prove new turn with the management of insect pests by biological methods. Earlier, some successful experiences are also conducted by (Irshad, 2008; Haq & Irshad, 2011). The present study in the basis step in the IPM and helpfully IPM biological control can permanently solve many pest problems. Shah et al., 1994 & 1997; when carried the survey in Madagascan showed a similar results on the African migratory locust and welling et al., 1995 also urged that this locust also produced conidial anamorph in vitro process and can be utilized against grasshopper.

Table.I. Showing the pest status along its collect number from various localities of Sindh, Pakistan

Taxonomic status of insects	Insect species status		Total No. of insects (N= 477)
	Major	Minor	
Oxya velox	Rice	Maize, Jowar	37
Oxya hyla hyla	Rice	Wheat, Grasses	48
Poekilocerus pictus	Akk	Wheat, Cotton	28
Hieroglyphus nigrorepletus	Rice, Sugarcane	Maize, Wheat	29
Hieroglyphus perpolita	Surrkanda	Grass, Maize, Sugarcane	41
Hieroglyphus orzivorus	Rice	Sugarcane	52
Acrida exaltata	Maize	Fodder crops	17
Duroniella laticornis	Maize	Sugarcane	09
Phlaeoba tenebrosa	Alfalfa	Grass, Fodder crops	21
Truxalis exmia exmia	Meadow grass	Thorn weed	37
Truxalis fitzgeraldi	Millet	Maize	41
Locusta migratoria	Rice, Sugarcane	Wheat, Cotton	53
Oedipoda fadtshenkoi pamirica	Wheat	Grasses, Vegetation	11
Sphingonotus sindhenesis	Cultivated field	Sorghum	19
Aiolopus thalassinus thalassinus	Bajra	Wheat	21
Sphingonotus rubescens rubescens	Paddy	Jowar	13

Table.II. Showing the isolation percentage of entomopathogenic fungi and their association with pest species of grasshopper which occurring in the Sindh.

Pest species of grasshopper	Associated fungi species on host species	No. of isolated fungi (N=198)	Isolation percentage (%)
Oxya velox	*A.niger*	13	6.56%
Oxya hyla hyla	*A.fumigutus*	12	6.06%
Poekilocerus pictus	*A.niger*	19	9.59%
Hieroglyphus nigrorepletus	*A flavus*	14	7.07%
Hieroglyphus perpolita	*A.fumigutus*	18	9.09%
Hieroglyphus orzivorus	*A flavus*	33	16.66%
Acrida exaltata	*A.niger*	03	1.51%
Duroniella laticornis	*A.fumigutus*	02	1.01%
Phlaeoba tenebrosa	*A.niger*	07	3.53%
Truxalis exmia exmia	*A.niger*	13	6.56%
Truxalis fitzgeraldi	*A flavus*	21	10.60%

Locusta migratoria	*A.fumigutus*	23	11.61%
Oedipoda fadtshenkoi pamirica	*A.niger*	05	2.52%
Sphingonotus sindhenesis	*A flavus*	03	1.51%
Aiolopus thalassinus thalassinus	*A.niger*	03	1.51%
Sphingonotus rubescens rubescens	*A.fumigutus*	09	4.54%

Table-II Showed that infection of *A.flavus* was reported significantly highest i-e 16.66% on *H.oryzivorus* followed by *L.migratoria* which was infected by *A.fumigatus* and greater infection percentage was reported for *T.fitzgeraldi* contaminated with *A.flavus*. However, *A.niger* also infected the 02 small grasshopper i-e *O.velox* and *O.hyla hyla* with 6.56% and 6.06% reporting and its less infection was reported on the *O.fadtshenkoi pamirica* it might be its large size. Shah et al., 1994 also reported that small size species die earlier when getting infection of fungi when compare to medium or large species they reported 25 mortality within 10 days and 03 within 11-30 days to some - extend present study agreed with previous workers.

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