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FIRST RECORD OF *ANISOPTEROMALUS CALANDRAE* (HOWARD, 1881) (HYMENOPTERA: CHALCIDOIDEA: PTEROMALIDAE) AS A POTENTIAL BIO-CONTROL AGENT OF STORED GRAIN BEANS FROM RAWALPINDI AND ISLAMABAD

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ABSTRACT

The parasitoid species, *Anisopteromalus calandrae* (Howard, 1881) (Hymenoptera: Chalcidoidea: Pteromalidae) is recorded for the first time from Rawalpindi and Islamabad Punjab (Pakistan). It was detected on mung bean (*Vigna radiata*) and kidney bean (*Phaseolus vulgaris*); damaged by two species of Genus *Callosobruchus*: *C. chinensis* and *C. maculatus*. Main identification characters and measurements of taxonomically important parts supported with micrographs have been given for future identification and its possible utilization against *C. chinensis* and *C. maculates* on various stored products.

Keywords: *Anisopteromalus calandrae*, bio-control agent, stored grain beans

INTRODUCTION

The wasps belonging to genus *Anisopteromalus* Ruschka (Pteromalidae) are parasitic on Coleopterous insect pests of mostly stored grains (Noyes, 2013). Only seven species of this genus have been reported from various parts of the world (Noyes, 2013). One more species has been recorded from India (Gupta and Sureshan, 2014). A few records of this genus are also parasitic on two Lepidopterous families, Plutellidae and Lymantriidae (Herting, 1975, 1977; Beccaloni et al., 2003). This genus can be identified with the combination of following characters: Notauli finer, indicated only anteriorly; clypeus shallowly emarginate; propodeum medially raised without cross carina; gaster with tergites 1-3 covering more than half of it (Sureshan and Narendran, 2004).

Anisopteromalus calandrae is a parasitoid of beetles associated with stored grains and cosmopolitan in distribution (Sureshan, 2007). It has been reported from various parts of the world as a parasitoid of various stored grains and pulses beetles like *Stegobium paniceum, Sitophilus oryzae, Sitophilus granarius, Tribolium castaneum, Athesapeuta cyperi, Oryzaephilus surinamensis, Pempherulus affinis, Rhizopertha dominica and Callosobrochus* spp. (Sureshan, 2003). It has also been recorded as bio-control agent of *C. chinensis* and *C maculates* on various food commodities (Devi, 1996; Ngamo et al., 2007). Currently Fatima et al. (2016) mentioned *A. calandrae* as a larval parasitoid of *C. maculates* on chick pea in KPK (Pakistan). Here, we report it as a parasitoid of both species of Genus *Callosobruchus*: *C. chinensis* and *C. maculates* on beans and chickpea from various areas of Rawalpindi and Islamabad. This study will help to utilize this parasitoid of stored grain beans and grains as an important bio-control agent in integrated pest management program in industries related to stored grain Entomology.

MATERIALS AND METHODS

Mung bean (*Vigna radiata*) and Kidney bean (*Phaseolus vulgaris*) samples were collected from various areas of Rawalpindi and Islamabad in small plastic bags. They were placed in the laboratory at ambient temperature. After two weeks, *C. chinensis* and *C. maculates* were observed along with small parasitic wasps. Wasp specimens were collected with the help of a mouth aspirator. Some specimens were directly killed in potassium cyanide killing bottle and others were placed in 70% alcohol in glass vials for further studies. Specimens were identified using Nikon microscope (SMS-1500, with 30x 1-11.25x magnification) with the help of keys by Boucek

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and Heydon (1997), Rasplus (1988) and Sureshan (2010). Illustrations of main identification characters were prepared with same microscope and measurements were taken with stage and ocular micro-meters. Identified specimens were deposited in the Laboratory of Biosystematics, Department of Entomology, PMAS - Arid Agriculture University Rawalpindi.

RESULTS AND DISCUSSION

***Anisopteromalus calandrae* (Howard, 1881) (Fig.1-2)**

1881. *Pteromalus calandrae* Howard, *Ann. Report U.S. Dept. Agr. For1880*: 273, M. USA (Texas) (USNM, presumably destroyed).
1891. *Pteromalus oryzae* Cameron, *Mem. Proc. Lit. Phil. Soc. Manchester* 4: 184. India (Coimbatore) (syn. Boucek. Et al.1979. 435).
1913. *Neocatolaccus australiensis* Girault, *Mem. Qd. Mus*. 2: 306, Queensland (syn. Boucek.
1988, 414).
1937. *Neocatolaccus indicus* Ayyar& Mani, *Rec, Indian. Mus*. 39:126: F, India (Coimbatore)
(ZSI).
1972. *Pteromalus schwenkei* Roomi, Khan & Khan, *Z. Angew*. Ent 72: 395. F, Pakistan.

Main identification characters:

Body ranges from 2.7to 2.8 mm (Fig. 2C). Head and mesosoma bluish black (Fig. 2B). Head 2.2 times wider than longer. Laterally eyes 1.9 times longer than wider and dorsally 0.18 times longer than wider. Head finely reticulated. Antennae with scape not reaching median ocellus; pronotal collar with sharp edge, not carinate (Fig. 1C). Metasoma brownish black with green metallic shine. Forewing 2.2 times longer than wider with post marginal vein 1.3 times longer than marginal vein (Fig. 1AB). Coxae concolorous with mesosoma; femora brown except distal part and remainder of legs testaceous. Metasoma elongate, ovate, longer than head mesosoma combined (Fig. 2A).

Material Examined: Rawalpindi, 13-09-15, 9♀ and 1♂; Islamabad, 1-09-2016, 1♀ and 5♂; Rawalpindi, 27-09-16, 1♀ and 3♂; Islamabad, 09-09-2016, 2♀ and 2♂.

Measurements (mm)

Body length:2.8;antennal length: 1.12; lateral eye length: 0.41; lateral eye width: 0.22;dorsal eye length: 0.264;dorsal eye width:0.14;head width:0.96; head length:0.43; forewing length: 1.61:forewing width:0.72; length of marginal vein:0.22;length of post marginal vein:0.23.

Remarks: Specimens collected from Pakistan were compared with the published identification characters (Sureshan, 2007) and found similar except miner size variations. In different parts of the world, it has been recorded as a parasitoid of various stored grain pests (Sureshan, 2007). Benítez díaz and Costa (2014) have recorded it on *Zea mays* grains damaged by small beetles: *Sitophilus zeamais* and *Orizaephilus surinamensis* from Paraguay. Sasakawaet al. (2012) recorded a sibling species of *A. Calandrae* with a different chromosome number. Currently, Fatima et al. (2016) recorded *A. calandrae* as a larval parasitoid of *C. maculates* on chickpea in KPK (Pakistan). Here we report it as a parasitoid of *C. chinensis* and *C. maculates* on beans and chickpea from various areas of Rawalpindi and Islamabad.

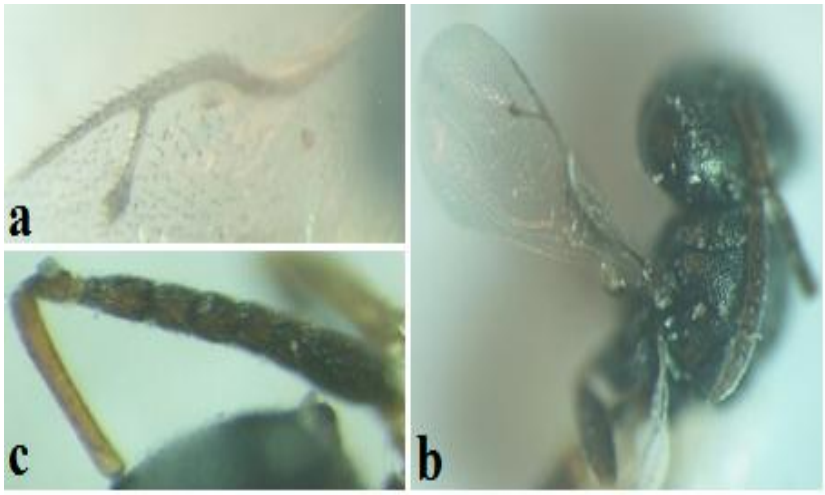

Fig. 1 (a-c): External morphology of *Anisopteromalus calandrae*
a. Forewing venation; b. Dorso-lateral view of female showing forewing; c. Antennae

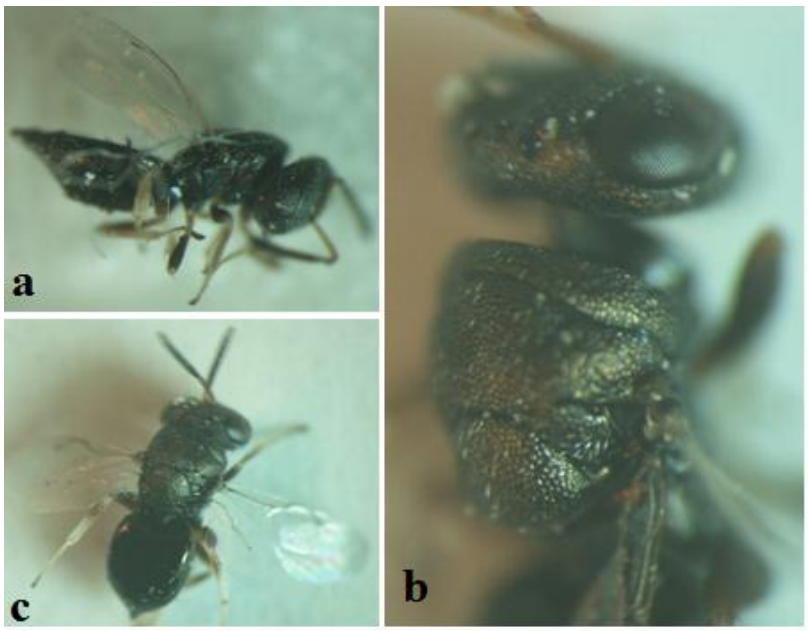

Fig. 2 (a-c) External morphology of *Anisopteromalus calandrae*
a. Lateral view of the female; b. Dorso-lateral view of head and thorax; c. Dorsal view of female

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