ADULT MORPHOMETRY OF PULSE BEETLES, *CALLOSOBRUCHUS MACULATUS* (FABRICIUS) AND *C. CHINENSIS* (LINNAEUS) COLLECTED FROM CHICKPEA GRAINS

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**ABSTRACT** : *Callosobruchus maculatus* and *C. chinensis* are the two predominant species of pulse beetle, found in India, which are generally wrongly identified. These two species of pulse beetles are sexually dimorphic and can be differentiated based on some morphological characters. *Callosobruchus maculatus* adults were chocolate brown in colour with black markings on the elytra whereas *C. chinensis* were reddish brown in colour without any markings on the elytra. The total body length of adult *C. maculatus* males and females was 3.82 ± 0.08 mm and 4.46 ± 0.10 mm, respectively. Whereas, in *C. chinensis* the length was 3.59 ± 0.04 mm in males and 3.94 ± 0.05 mm in females. The measurements of some other morphological traits of the adult male and female of both the species were also taken such as antennal length, 1.84 ± 0.07 mm and 1.93 ± 0.12 mm for male and female respectively, elytral length and width, 2.11 ± 0.02 mm and 0.98 ± 0.04 mm, respectively in male and 2.18 ± 0.14 mm and 1.08 ± 0.08 mm, respectively in females of *C. maculatus*. From the present study, it is confirmed that the females of both species were found to be longer than the males and most of the traits of females were larger in size than males except for antennal length.

**Key words** : *Callosobruchus maculatus*, *C. chinensis*, bruchids, morphometry, elytra, pygidium.

**INTRODUCTION**

Pulse beetle belonging to the genus *Callosobruchus* (Chrysomellidae family) are generally found in tropical and sub-tropical parts of India (Southgate, 1979), which causes severe damage in various pulses in the storage condition. There are three important *Callosobruchus* species commonly found in India, which include *Callosobruchus maculatus* (Fabricius), *C. chinensis* (Linnaeus) and *C. analis* (Fabricius) (Tuda et al, 2006). Among these *C. maculatus* and *C. chinensis* are predominately found in India. Initially, the infestation starts in the field causing very minimal damage to the crop and then after harvest, carries over to the storage causing very significant damage and weight loss of the grains. It is a holometabolic insect having four stages of development such as egg, larva (grub), pupa and adult. Generally, the grub is the damaging stage, which causes damage and makes the grain unsuitable for consumption as well as for germination by feeding inside the seed and then the adult comes out of the seed by making a window hole (Mutalikdesai and Lolage, 2023). The specific characteristics of these insects are the extended portion of the abdomen, which is devoid of the elytral covering, known as pygidium. The adult of both *C. maculatus* and *C. chinensis* are sexually dimorphic. Female pygidiums were remarkably convex on the sides, protruding well beyond the elytra, and coated with white scale-like setae, with two dark patches with a white longitudinal line whereas the male has short pygidium with no dark patches in the case of *C. maculatus*. There is a distinct dimorphism in the antenna of *C. chinensis*, where the males possess pectinate antennae and the females possess serrate antennae. But in the case of *C. maculatus* no such antennal dimorphism is found.

Since, the pulse beetle is an internal feeder and its damage symptoms cannot be observed in the very early
According to the current investigation, the average head length for male and female *C. chinensis* was determined to be 1.02 ± 0.09 mm and 1.14 ± 0.08 mm, respectively. While the average width was 0.58 ± 0.02 mm and 0.70 ± 0.04 mm for males and females.

**Distance between eyes**

The distance between the eyes was found to be 0.27 mm for both males and females in *C. maculatus* and 0.26 mm in *C. chinensis*. Kafom *et al.* (2017) reported the minimum distance between the eyes ventrally was found to be 0.28 ± 0.04 mm. Colgoni and Vamosi (2006) also found a constant value (0.80 ± 0.043 mm and 0.80 ± 0.046 mm) of the distance between eyes for both males and females of *C. maculatus* and 0.85 ± 0.041 mm in males and 0.83 ± 0.037 mm in females of *C. chinensis*. They concluded that the trait was found as non-significant.

**Length and width of pronotum**

In the case of males, the length and width of the pronotum were observed as 0.80 ± 0.07 mm and 1.11 ± 0.07 mm, respectively. The findings of this study are comparable with the findings of Kafom *et al.* (2017) where, they reported that the length and width of the pronotum of adult *C. maculatus* were found to be 0.76 ± 0.06 mm and 1.04 ± 0.07 mm, respectively. Similarly, Colgoni and Vamosi (2006) measured the length and maximum width of the pronotum both for males (0.70 ± 0.057 mm) and females (1.17 ± 0.086 mm).

In the case of *C. chinensis*, the length of the pronotum was found to be 0.74 ± 0.06 mm and 0.78 ± 0.08 mm in male and female beetle. Similarly, the width of the pronotum was found to be 1.18 ± 0.08 mm and 1.26 ± 0.09 mm in males and females (Table 2). Colgoni and Vamosi (2006) reported similar observations of the pronotum length of males (0.76 ± 0.046 mm) and females (0.80 ± 0.043 mm) and also the pronotum width of males (1.25 ± 0.080 mm) and females (1.32 ± 0.073 mm).

**Length and width of elytra**

The length and width of the elytra of male *C. maculatus* were found to be 2.11 ±0.02 mm and 0.98 ±0.04 mm, respectively while, in the case of female it had a slightly larger elytra with 2.18 ±0.14 mm length and 1.08 ±0.08 mm width (Table 2). According to Colgoni and Vamosi (2006), the length and width of the elytra of males were found to be 1.84 ± 0.13 mm and 0.83 ± 0.059 mm, respectively whereas for females, 1.93 ± 0.11 mm and 0.86 ± 0.074 mm. Kafom *et al.* (2016) also reported that the maximum length of elytra was found to be 1.73 ± 0.14 mm in Senegal.

Similarly, the elytral length and width of male *C. chinensis* were computed to be 1.74 ±0.08 mm and 0.82±0.02 mm, respectively, and of female, 1.82±0.12 mm and 0.93±0.04 mm, respectively (Table 2). Kashyap *et al.* (2021) also reported the elytral length and width of male (2.15±0.01 mm and 1.14±0.01 mm) and female (2.52±0.01 mm and 1.30±0.07 mm) of *C. chinensis* on chickpea. Whereas, on mung bean, the length and width of elytra were found to be 2.21±0.01 mm and 1.21±0.01 mm, respectively for males and 2.65 ± 0.02 mm and 1.38±0.01 mm, respectively on mung bean.

**Length and width of pygidium**

The results of the current study showed that the average pygidium length and breadth for female *C. maculatus* were determined to be 1.18 ± 0.10 mm and 0.92 ± 0.09 mm, respectively and 0.95 ± 0.08 mm and 0.78±0.07 mm, respectively in male. Whereas, in *C. chinensis* these were found as 0.92±0.09 mm and 0.84±0.08 mm, respectively in males and 1.06±0.11 mm and 0.98±0.10 mm in females.

**Spines or teeth present on the femur**

The inner tooth was triangular in shape and was usually slightly longer than the outer tooth. From the present study (Table 2), it was found that both in male and female two acute teeth were present on the hind femur of both *C. maculatus* and *C. chinensis*. It was confirmed from the study that the number of teeth did not vary. Magaji *et al.* (2020) strengthened this hypothesis by establishing the number of teeth in *C. maculatus* as a non-significant parameter.

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