Callosobruchus maculatus is a deadly pest of stored pulses. The non-feeding adult beetles move around the grains, oviposit on them and die in about 10 days. The eggs hatch into tiny apodous grubs that bore into the grains and complete their subsequent development by feeding on the contents of the grains. The grubs pupate inside the grains and adult beetles eclose from the spent grains. The present study on *C. maculatus* has very clearly elucidated its biology on four different grains.

Even though the beetle can survive on all the four grains tested, the various biological phenomena like adult longevity, fecundity, life stage periodicities, egg hatchability and reproductive success are at the optimum levels in the cow pea, *V. unguiculata*. Thus cowpea forms the ideal diet of *C. maculatus* and most of the comparisons are based on the life history and reproduction of the beetle on this diet. The beetles were reared on *V. radiata* (green gram), *V. mungo* (black gram) and *Cicer arietinum* (Chick pea) and their biological characteristics were recorded. The total developmental period was highest in *V. mungo* (35±2.87) and lowest in *V. unguiculata* (26±2.16). Maximum longevity was recorded in *V. mungo*, 13.1 ± 1.3 days for male and 16.8 ± 2.74 in the male. Even though the longevity was more, the beetles laid less number of eggs in *V. mungo* (44.4±10.81). Morphometric analyses of the head, thorax and abdomen and the associated structures were done in *C. maculatus* individually reared on the four grains. Comparison between head morphometry and larval biomass revealed significant positive correlation (r=0.81 to 0.99). The oviposition preference of *C. maculatus* females was studied by providing different types of grains in extended as well as abbreviated tube experiments. Even in high beetle densities, the beetles preferred to lay eggs on nearby seeds and not on
the preferred seeds far apart. About 60 percent of *Prosopsis juliflora* seeds carried eggs when 400 adult females were released. By virtue of the position of the grains of *P. juliflora*; in an area close to beetle release, they were visited by more number of beetles. In the abbreviated tube experiment, in maximum beetle density, highest percentage of grains carrying eggs (PGCE) was recorded in *A. precatorius* (92.3±6.81). In circular chamber experiment, *V. radiata* was the most preferred grain for laying eggs, possibly due to the fine texture of the outer seed coat. When assorted grains were offered, almost equal preference was shown for *V. unguiculata*, *V. radiata* and *C. arietinum*. When splintered grains were offered for oviposition, the smaller pieces were totally discarded. The two splintered pieces of *C. arietinum* were preferred for oviposition, perhaps, because of their larger size. The female beetles clearly know whether the grain has sufficient biomass to support development of the grubs that hatch out from the eggs deposited by them.

The lower strata in bins are not ideal for the development of *C. maculatus* and this has been proved by keeping grains containing pupae in different locations of a simulated bin. In the lower strata, eclosion, subsequent mating and egg laying were minimum or absent. *C. maculatus* requires enough space at top of the bin for normal movement, mating and oviposition.

When oviposition was tested at different strata of grains by allowing female *C. maculatus*, egg deposition was observed even in the lower strata of *C. arietinum*. This was due to the shape of this grain that does not allow it to be compacted as other grains and whatever little space in between grains is utilized by the beetles.
he fact that egg laying depends on the free surface of the grains available has been proved by providing containers having different mouth area. Laying was maximum in grains taken in a petri dish since the available open area is more than that of volumetric or conical flasks. The ovipositional preference on the grains has been statistically tested using ANOVA and Tukey analysis.

Biology of *C. maculatus* was studied in different grains. Adult emergence decreased and high mortality of immature stages was recorded when splintered grains were offered to *C. maculatus* for oviposition by no choice experiments. Mortality was as high as 95.11±5.34 percent when *C. arietinum* grains splintered into eight pieces were offered for oviposition and larval development of *C. maculatus*. The reproductive potential (rm) was 0.3 for intact *V. unguiculata* where as it was 0.1 for splintered *V. radiata*.

The adult longevity of the beetles was prolonged up to 70 days when the beetles were fed with sugar and provided no grains for oviposition. The non-ovipositing females probably fed on sugar and sustained for longer periods of time.

The mating chronology was tested in beetles exclusively raised on different feed materials. The timing of mating events was ideal for *V. unguiculata*. *C. maculatus* larvae showed cannibalistic behaviour. When more larvae developed within a grain, there was stiff competition between them resulting in cannibalism and only one successful adult emerged from a grain.

Management of *C. maculatus* was tried using a number of non-conventional strategies designed to intercept the pest at different levels. The latex of *Hevea*
*braziliensis* and *Euphorbia thirukalli* were very effective in preventing oviposition by *C. maculatus* at 9:1 latex-oil ratio.

The resins of *Azadirachta indica* and *Moringa indica* and paraffin wax were effective oviposition inhibitors. *A. indica* resin was very effective at the highest concentration of 4ml/100g grains.

About 13 medicinal weed plants were tested for their oviposition deterrent activity on *C. maculatus*. *V. rosea* was the most effective plant that deterred *C. maculatus* from laying eggs as well as preventing adult emergence. Four different ethanobotanicals were tested for their oviposition deterrence activity against *C. maculatus*. *Acorus calamus* was very effective in preventing oviposition and adult development.

Ammonium carbonate was very effective in curbing oviposition compared to common salt and sugar. UV radiation and solarization killed eggs as well as larvae. The traditional practice of sun drying kills all life stages of insects when done for about 3 h. The traditional methods of protecting pulses by keeping them in pots and covering the grains with a layer of soil or fine grains has been field tested and it was found that pulses thus protected, remained free from infestation for more than one year.

Biol e p (*Bacillus thuringiensis* preparation) and ecocill (*Verticillium lecanii* preparation) were sprayed on pods in the field and such pods remained free of infestation with minimum adult emergence when 5g/dl of the biopesticide was used for spraying.
Biosmoke generated by incinerating *A. calamus* and *C. longa* rhizomes and *H. suaveolens* leaves was tested in a special fumigation equipment against life stages of *C. maculatus*. *A. calamus* biosmoke was the most effective in killing life stages.

Designs of different types of storage bins were suggested using computer derived diagrams. The bins were designed to cash upon certain characteristic features of *C. maculatus* related to movement and oviposition.

A parasitoid facilitator bin was designed and tested. The egg and larval parasitoids of *C. maculatus* entered through small perforations on the lid of the bin and killed eggs as well as grubs.

Toxicant filled cloth bag when interspersed in the bin emanated the odour of either the plant product or the chemical toxin driving the adults into probe traps attached to the basic bin design. Maximum beetles were trapped when *A. indica* leaf powder was used as the toxicant.

The TNAU probe trap was modified and tested for its efficiency in trapping beetles. When 500 beetles were released about $339.6 \pm 21.99$ beetles were trapped over a period of 5 days.

The efficacy of different plant products used as toxicants against *C. maculatus* was tested using one way ANOVA and Tukey analysis. Most of the different plant products were significantly different from one another in their impact on *C. maculatus*. Similarly the number of beetles released was significant in determining the number caught in probe traps.
Stack storage system, Fumigant chamber, Multipurpose bin, Modified broad surface pitfall cum Probe trap, Traditional storage bin, Spire storage bin and Farm level storage pot designs were developed, supported by logical explanations of their working. Such storage structures would prove to be efficient systems to handle *C. maculatus* infestation. The different management systems are expected to bring down insect infestation of pulses, thereby saving grains from destruction and damage.