STUDIES ON TBE HOST RANGE OF BRUCHID BEETLE (CALLOSOBRUCHUS CHINENSIS.L)

RIKAZA M.A. AND RAVEENDRANATB S.
DEPARTMENT OF AGRONOMY
EASTERN UNIVERSITY, SRI LANKA

INTRODUCTION:

Pulses are healthy and versatile foods as they produce many of the nutrients are human needs, but they are subjected to extensive insect attack during growth and storage. Bruchids are the key pest causing serious seed deterioration during storage, predominantly by Callosobruchus chinensis and Callosobruchus maculates (Dharmasena and Subasinghe, 1986). Therefore the importance of ~he additional pulses that can be available for human consumption by pest free or pest-controlled storage is intensely felt. There is an urgent need to develop economically and ecologically safer and sounder pest control techniques, which could be used both by farmers and traders. The C. chinensis feeds in a wide range of hosts; therefore it is essential to understand the host preference of this pest. An attempt could be made in this study to test the host range of C. chinensis.

OBJECTIVE:

Test the host range of bruchid beetle (Callosobruchus chinensis.L) on selected common pulses in storage.

MATERIALS & METHODS:

This study was carried out in the Agricultural biology laboratory of Department of Agronomy, Eastern University, Sri Lanka. The experiment was conducted in Completely Randomized Design(CRD).

Two methods were used to find out the host range of pulses seeds to Callosobruchus chinensis among five different pulses. Olfactometer bioassays were performed to evaluate the effect of host preference on the orientation of selected pulse species. When introducing the adult weevils, the weevils were collected from each selected pulses culture. The experiment was done male and female with separately at 5 times. The number of adults emerged on each host and the number of days were taken to developed adults were observed and recorded. The results were subjected to analysis of variance ANOV A and the means were compared using Duncan's Multiple Range Test (DMRT).

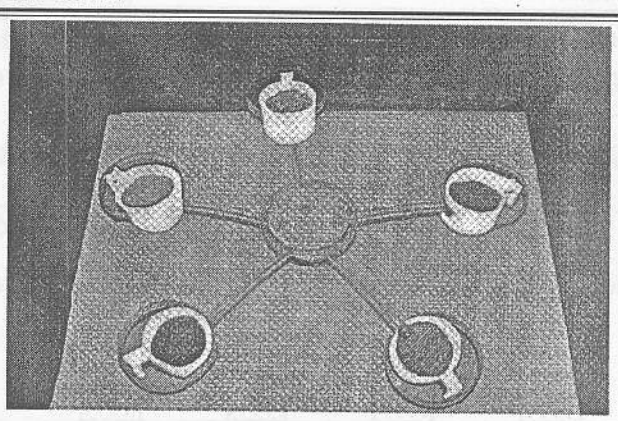


Plate 1 : olfactometer

RESULTS AND DISCUSSION:

Effect of host seeds on C. chinensis development period

The development time of adult C. chinensis on different host species in shown in figure1

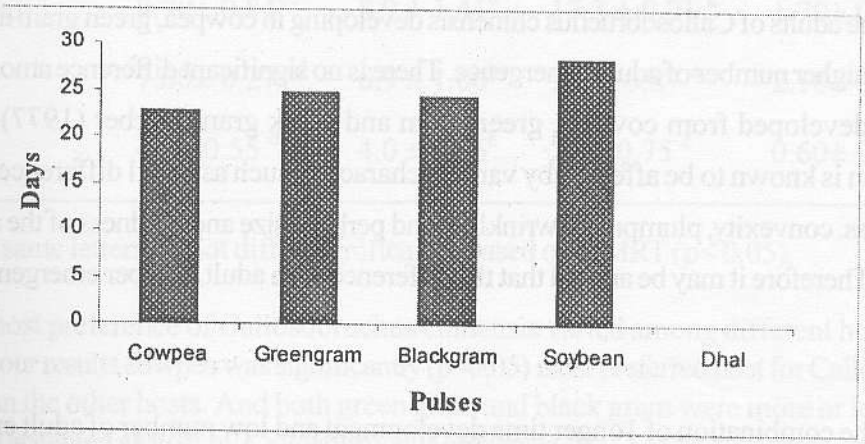


Figure 1: Development periods of C. chinensis on different pulses.

The shortest and longest time taken for development of Callosobruchus chinensis was recorded on cowpea and soybean respectively. But there is no significant difference ($p<O.O5$) on the development time of C. chinensis between green gram and black gram was observed. Applebaum (1965) mentioned that saponin as specific metabolic defense mechanisms of soybean evolved against insects. There may be suggested that the saponin of soybean may be the factor on longest time of Callosobruchus chinensis development. Findings from this study reveal that masurdhal was not a favourable for Callosobruchus chinensis. This is clearly indicated by the non-development of adults from dhal .The fact that dhal is probably unrelated to suitability of the host development of Callosobruchus chinensis. The physical texture of seed coat, its size, colour and odour could have been responsible for the differential oviposition as indicated by number of authors (Watt et at 1977; Ishii et at 1952; Lambrides and Imrie 1999; Howe and Currie 1964). So that above factors of dhal may be contributed in non development of adults from dhal.

Applebaum et at. (1968) and Applebaum and Brick (1972), reported that the presence of certain amino acids and saponin delay the development ofbruchids. However, Brorchers et at (1947) in his review reported many legume seeds contain factors affecting the digestibility of protein by the inhibitory proteolytic enzymes in bruchids.

Emergence of Callosobruchus chinensis on different pulsis

The number of adults emerged on different pulses is shown in figure2

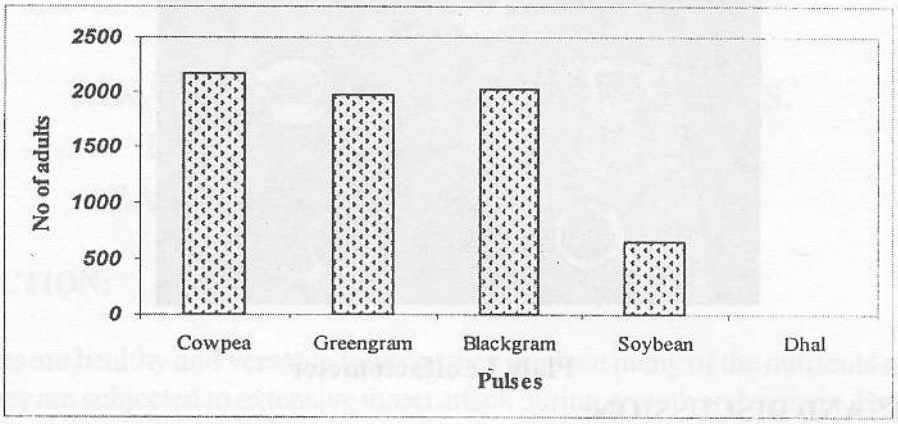


Figure 2: Number of C. chinensis adult emerged on different pulses.

The adults of Callosobruchus chinensis developing in cowpea, green gram and black gram produce a higher number of adults emergence. There is no significant difference among the number of adults developed from cowpea, green gram and black gram Horber (1977) reported that oviposition is known to be affected by various characters such as small differences in seed coat, smoothness, convexity, plumpness, wrinkling and perhaps size and hardness of the seed as well as its odour. Therefore it may be argued that the difference with adult number emergence may be due to this.

The combination of 1onger time development and low number of adult emergence was also found for Callosobruchus chinensis grown on soybean compared to other treatments. It has been suggested that the growth and development of C. chinensis depends on the nutritional value of soybean seeds (Howe and Currie 1964; Applebaum 1965; Applebaum 1968). The developmental incompatibility of soybeans for Callosobruchus chinensis L. is partly attributed to the presence of soybean saponins. Larvae of Callosobruchus do not hydrolyse saponins in vitro. These saponins may therefore be regarded as specific metabolic defence mechanisms of the soybean evolved against Callosobruchus chinensis (Applebaum, 1965).No adult emergence was observed in Callosobruchus chinensis reared on dhal. But the none emergence of adults of C. chinensis is not clear. However it could be caused by visual effects as host pulses had a differential effect on colour or olfaction and by chemical composition of dhal.

Host preference of Callosobruchus chinensis adult

The host preference of C. chinensis adults cultured in different host species is shown in following table and figures

Table: 1 Host preferences of C. chinensis adults cultured in different host species

Mean of number of adult reached ± SE (N= 10)	*C. chinensis* adults cultured in different host species			
	Cowpea	Black gram	Green gram	Soy bean
Cowpea	18.0 ± 0.81 ^{a}	13.8 ± 0.84^{a}	12.0 ± 1.18 ^{b}	3.20± 0.29^{a}
Black gram	10.40± 1.03 ^{b}	16.7 ± 1.09^{a}	13.6 ± 1.03 ^{b}	2.30± 0.26^{b}
Green gram	9.70± 0.84^{bc}	8.9 ± 1.41^{b}	17.3 ± 0.91 ^{a}	1.70± 0.21^{b}
Soy bean	7.00± 0.27 ^{cd}	6.9 ± 1.00^{bc}	5.2 ± 0.87 ^{c}	2.10± 0.18^{b}
Dhal	4.5± 0.55 ^{d}	4.0 ± 0.56^{c}	3.1± 0.75 ^{c}	0.60± 0.16^{c}

Means of the same letters do not differ significantly based on DMRT ($p< 0.05$).

The host preference of Callosobruchus chinensis varied among different host species. According to our results cowpea was significantly ($p<0.05$) most preferred host for Callosobruchus chinensis than the other hosts. And both green gram and black gram were more or less equally preferred and accepted as host by Callosobruchus chinensis.

The soybean was significantly ($p<0.05$) less preferred by Callosobruchus chinensis as indicated in the results. The adult cultured in soybean did not show any significant preference to green gram and black gram. The results finding shows dhal was unfavorable host for Callosobruchus chinensis due to its lowest preference. The preference of green gram and black gram of Callosobruchus chinensis was significantly lower than cowpea and significantly higher than soybean and dhal. Callosobruchus chinensis preferred soybean compare to dhal might be due to the chemical composition of soybean. Applebaum, (1965) reported that all the known protease inhibitors in soybeans, and also urease, have no apparent effect on the development of this beetle. So that saponin fraction C and urease are ovipositional attractants of Callosobruchus. Therefore it may be argued that the preference of Callosobruchus chinensis towards soybean may be due to this.

There is no significant different found between the male and females in reaching the five species of host pulses. This indicates that the sex do not influence the host preference of Callosobruchus chinensis.

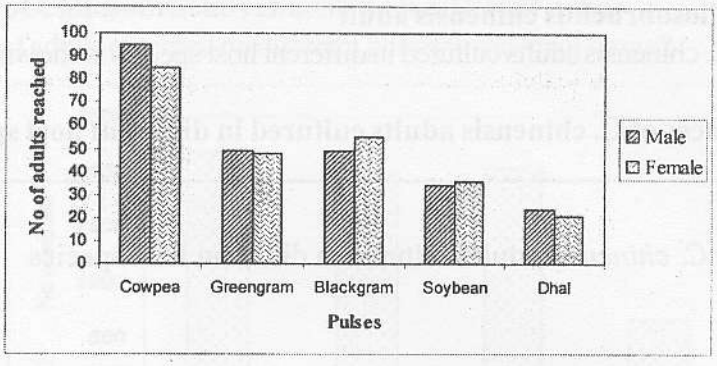
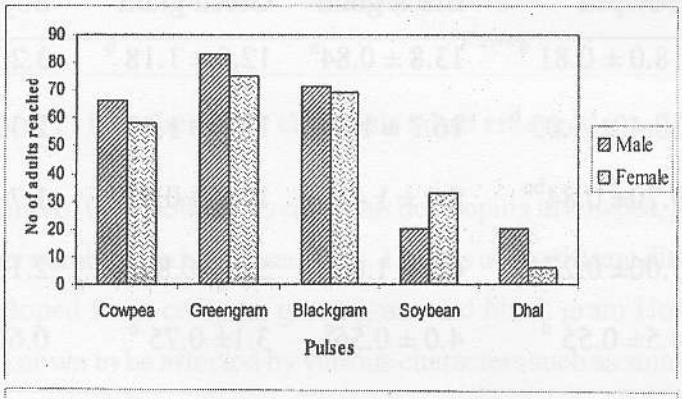


Figure 3: Host preference of C. chinensis adults cultured in cowpea



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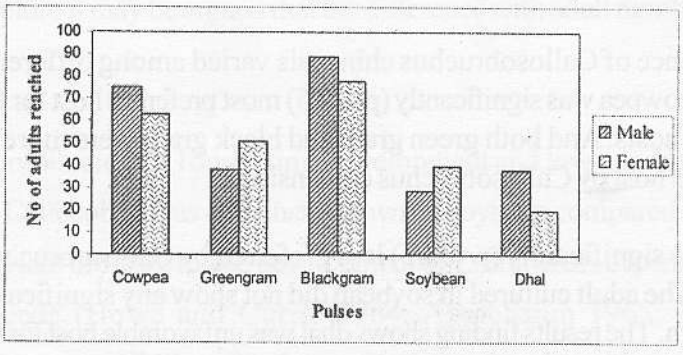

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Figure 5: Host preferences of *C. chinensis* adults cultured in black gram.

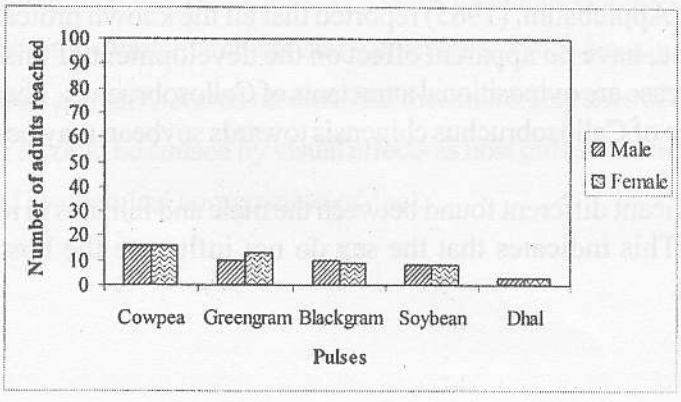

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Figure 6: Host preference of *C. chinensis* adults cultured in Soybean

Host preference of C. chinensis to particular host cultured in different host

The host preference to particular host of adults C. chinensis cultured in different host is. shown in following figures.

This particular insect species preferred the host in which they reared on. However, the affinity towards cowpea was relatively higher compared to other host species. This may be attributed to the fact the initial stock was obtained from cowpea and the another experiment also indicated that Babu et aZ. (2003) reported that the Callosobruchus chinensis finding the host through volatiles collected from healthy cowpea seeds were attractive to bruchids. So that it may be the reasons for most affinity of C . Chinensis towards cowpea.

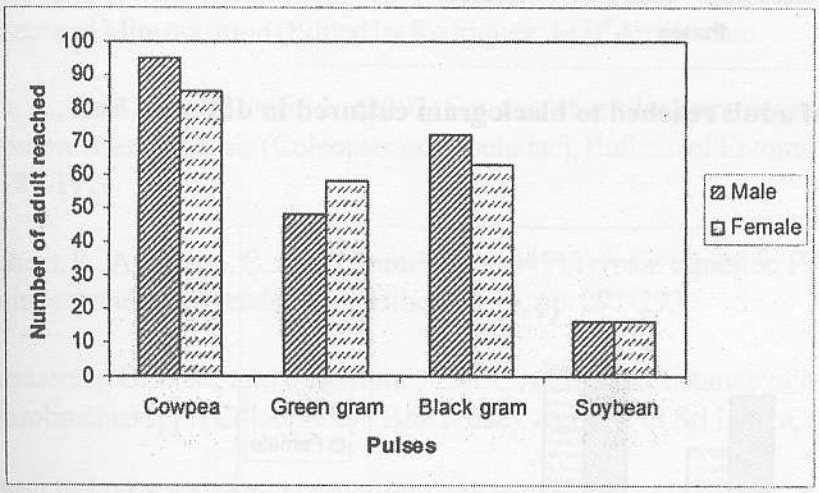

Figure 7: Number of adult reached to cowpea cultured in different host

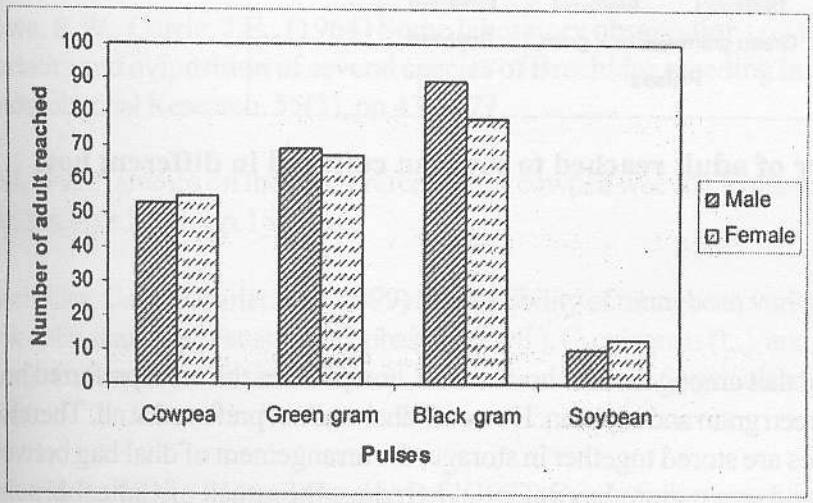

Figure 8: Number of adult reached to green gram cultured in different host

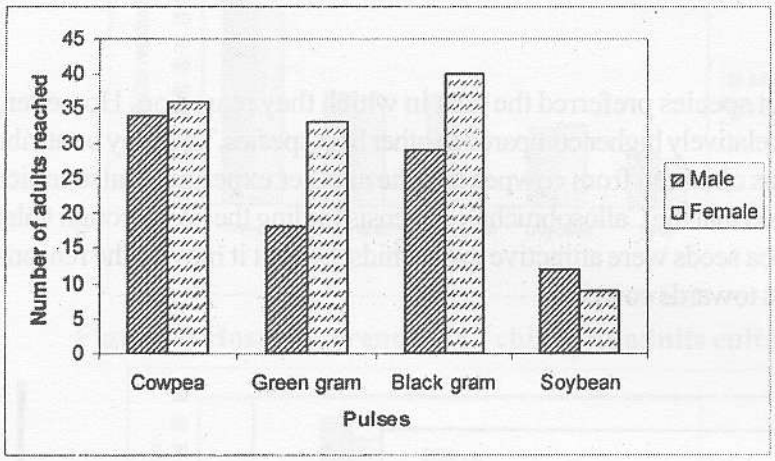

Figure 9: Number of adult reached to black gram cultured in different host

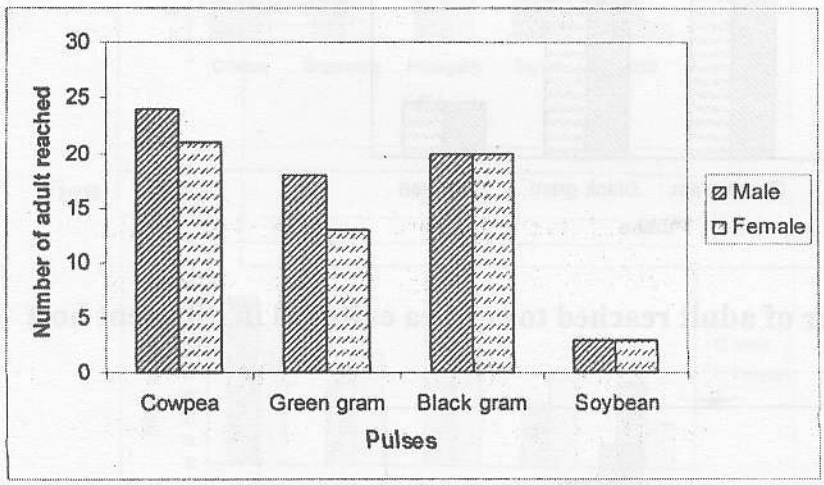

Figure 10: Number of adult reached to soybean cultured in different host

CONCLUSIONS:

This study showed that among the five hosts tested, cowpea was the most preferred host, followed by black gram, green gram and soybean. However dhal was not preferred at all. Therefore when different host species are stored together in storage, the arrangement of dhal bag between the cowpea, black gram and green gram has potential to reduce the attack of Callosobruchus chinensis due to preventing the dissemination among host species and also arrangement of soybean between the most preferable hosts of Callosobruchus chinensis might reduce the spread of infestation.

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