INTRODUCTION
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The genus *Bruchidius* Schilsky, belongs to the family *Bruchidae* of the order *Coleoptera* comprising nearly 1,300 described species (Johnson, 1970), the majority of whose larvae (85% Johnson, 1970) develop within the seeds of Leguminosae and are of undoubted economic importance as major pests of legumes, one of the most important groups of plants serving as human food and animal fodder. They are not only the serious pests of edible pulses, beans, lentils and peas but also attack the pods and seeds of the wild forest, medicinal and ornamental plants. Some of them have been reported to attack or are associated with the flowers or leaves of plants belonging to the families Composite, Malvaceae, Convolvulaceae, Anacardiaceae, Rosaceae, Umbelliferae, Papaveraceae and Salmae (Arora, 1977). Johnson and Kingsolver (1975) noted that Arizona wild grape (*Vitis arizonica*) family Vitaceae, is infested by *Aenibacterus vitis*. According to Center and Johnson (1974), the larvae of *Bruchidae* attack the seeds of some 30 plant families other than Leguminosae.

The bruchids lay their eggs on the seeds, on the developing green pods and even on the ripe pods, the first
Stage larvae making their way into the seeds after a period of embryonic development, moulting several times. The larval instars are voracious eaters which eventually pupate inside the seeds or make cocoons outside the seeds, finally resulting in the adults emerging through small holes in the seed coats, or in the seed coat and the dry pod, or in the wall of cocoon.

Bruchids were known to the early scientists and the name Bruchidae to the family of pulse weevils was given by Linnaeus (1767). They have been characterized by the presence of pseudotetramerous tarsi, the fourth tarsomere being covered by the bilobed third tarsomere. The head is small, usually somewhat retracted into the prothorax. The mouth parts are directed forwards and downwards. The eyes are emerginate anteriorly. The antennae are 11-segmented, serrate to pectinate. The prothorax is oval, bell-shaped, conical or trapezoidal. The elytra generally leave the pygidium uncovered. The hind legs are usually much longer and thicker than the fore and the middle legs; the hind femora may be thickened, flat, uncarinate or bicarinate below, the carinae with or without preapical spines or the single carina may bear a comb-like row of spines.

The hind femora, in the sub-family Bruchiinae to which the genus Bruchidius belongs, are moderately thickened, flat or channelled ventrally with one or both edges carinate;
carinae with or without preapical spines but without a comb-like row of spines. The hind tibiae are straight or slightly arched and are without movable spurs. The antennae are serrate to pectinate and the scutellum is quadrangular. The striae on the elytra are partly abbreviated and not reaching the apex.

The members of the genus Bruchidius are with hind femur caraliculated below, with a minute preapical tooth on the inner carina, not accompanied by smaller teeth. All the Indian species of the genus have been reported (Arore, 1980) to attack the pods and seeds of the non-edible plants of less known economic importance, some of which are important from the forestry point of view whereas there are plants having a medicinal or ornamental value. Quite a few also attack the noxious weeds associated with our crops, and acting as their major seed destroyers, forming a means of biological control of the noxious weeds, controlling their growth and multiplication.

The review of literature shows that the economic importance of Bruchids as pests of edible seeds has been recognized as far back as (1867) by Geinitz, (1876) by Fitch and (1890) by Sharp and the studies relating to the bionomics, ecology, biology, life-history and control etc. of these insects have continuously been made from the end of the nineteenth century. The bruchids which breed on the grains in
the stores drew the main attention of the workers whereas only a negligible work has been done on the forms which attack non-economic plant hosts in the field. The earliest of the important workers include Riley and Howard (1892), Riley and Washington (1892) who described the first larval stages of the pea and bean weevils. Slingerland (1893) observed the adults of Bruchus obtectus feeding upon the leaves of the host plant until the pods were nearly full grown while making observations on B. quadriraculatus and B. obtectus. Chittenden (1898-1912a) worked on the broad bean weevil Larva rufieiana and the cow pea weevil Acanthoscelides chinensis, while Paddock and Reinhard (1919) noted that the females of Callosobruchus chinensis check up the laid eggs before leaving them. Kasergode (1920) gave a small account on the bionomics, Bondar (1921) worked on the larva of Bruchus nucleorius. Back (1922) described the habits of the larvae of bean and pea weevils whereas Bridwell (1923) noted the habits of the adults of Acanthoscelides obtectus. Sunhi Kannan (1919, 1923) made an extensive study of the prothoracic plate in the larvae of several bruchid beetles. Larson and Simmons (1923) gave notes on the biology of Bruchus quadriraculatus. Larson et al. (1924, 1927, 1931, 1933, 1938) dealt with the biology of the pea weevil Bruchus quadriraculatus, the bean weevil Acanthoscelides obtectus and
the southern cowpea weevil *Callosobruchus maculatus.*

Brauer (1925, 1926) studied oviposition and embryology of *P. quadrimaculatus,* and Brauer and Taylor (1936) experimented on the eggs of certain bruchids to determine the time and organization of bruchid eggs. Skaife (1926) gave a detailed, generalized account of the life cycle and habits of the South African bruchids and reared some seventy species collected from the ripe seeds of legumes. Feytaud (1926) dealt with the bionomics of *Acanthoscelides obtectus.* Henriksen (1927) gave an account of some of the Danish bruchid larvae whereas Boving (1927) devised a key of the larvae belonging to the genera *Xylabris,* *Spermothragus* and *Pachymus.* Daviault (1928, 1928a) studied the biology and the post embryonic development of *Acanthoscelides obtectus,* and described briefly the morphology of the first and second larval instars. Zacher (1929) reported that the smell of the host plays a part in oviposition and the sense of touch acts as an incucment. He arrived at this conclusion after observing that no eggs were laid by females of *Spermothragus subfasciatus* on the seeds with peeled off skins. He (1930) listed four larval stages in *Zabrotus subfasciatus.* Bondar (1931b, 1931c, 1937) made observations on the biology of the genera *Spermothragus* and *Pseudopachymus.* De Giudice (1931) worked on the biology and morphology of *Bruchidius symmetricus.* Lazarev (1931) gave an account of biology of *Larva (Bruchus) risi.* Wakeland (1934a) made ecological studies of *Bruchus pisi.*
Herford (1935) noted some biological habits of *Acanthoscelides obtectus*. Mukerji and Bhuya (1937a) studied the reproductive system of *B. quadrinaculatus* whereas Mukerji (1938) delineated its larval stages into the boring phase and the nutritive phase, and studied the method of emergence of the first stage larva from the egg and its subsequent entry into the seed. Utida (1941) made studies on the population of *Callosobruchus chinensis* and later (1959) reported the sequential frequency of its adults. Lepesme (1942) discussed about the hatching behaviour of the primary larva of *Acanthoscelides obtectus*. Rahman Khan et al. (1942) published preliminary notes on the biology of *Bruchus analis* and *Bruchus chinensis* whereas Cobind Ram (1945) reported the life cycle of *Bruchus analis*. Steffen (1945) published an account of the four larval instars in *Zabrotes subfasciatus*. He later (1946) described the primary larva of *Bruchidius fasciatus* and its relationship with other bruchid larvae.

Tassou (1948a) observed the ovipositional behaviour of the bean weevil, *Acanthoscelides obtectus* and later (1951, 1953) discussed the factors responsible for the choice of host. He conducted several experiments with *Bruchus (Acanthoscelides) obtectus*, *Bruchus (Callosobruchus) maculatus* and *Bruchus (Callosobruchus) chinensis* and found that the palpation as well as the sense of smell play a major role in selecting the host for oviposition, the attraction for the favourite host being
not constant, but varies according to the age of the insect. Hinman et al. (1949) observed the hibernating habits of the pea weevil, whereas Vasilev (1951) gave a brief information about its peculiarity of egg laying. Peake (1952) while making observations on the biology of Bruchus baudoni found that the eggs are not laid in exposed position but are deposited in broken portions of the pods of Acacia arabica, where crevices and natural excavations provide protection to the eggs. Genduso (1953) noted some habits of Bruchidius silvus and Bruchidius popillieri. Hirano and Umeya (1953) showed relationship between the duration of adult life and the quantity of the decreasing fat content in the body of Callosobruchus chinensis. Abou-Rayas (1954) proved that Bruchidius alfieri Pic., is a biological race of Bruchidius trifoliatus (Notsch.). It was also confirmed by Hafez and Osman (1954) who later (1956) made detailed biological studies on the host plant Trifolium alexandrium a main fodder plant in Egypt. El-Swaf (1954) showed that in Callosobruchus maculatus, it is the sense of smell which is responsible for the selection of hosts, whereas in 1961 he studied the factors affecting its oviposition and developmental rate. Cancela de Fonseca (1955) contributed towards the ecological studies of Jacymenes acacias. De Luca (1956) published an account of the morphology and biology of E. lentis, in 1959 described in detail
the morphology of the various larval instars of *Bruchidius trifolii* and in 1963 dealt with the external morphology of the first stage larva of *Pseudorachymes luttament*i. Arora and Pajni (1957) made observations on the biology and oviposition of *Bruchus analis*, and in 1959 studied the effect of temperature and food on the developmental period of *Callosobruchus analis*. Arora et al. (1969) published the bibliography of family Bruchidae. Arora and Singh (1970) reported the biology of *Callosobruchus chinensis*. Arora (1973) classified and gave detailed descriptions of the final instar larvae of 36 species of Bruchidae from North-West India whereas in 1980 he published a detailed report on the biology and taxonomy of the genus *Bruchidius*, with which work I was also associated and a part of the results I was permitted to use as a part of my thesis. Grigosov (1960) contributed to the bionomics of the pea bruchid, *Bruchus pisum*. Hinckley (1960) published an account of the bionomics and mortality of the Klu-beetle *Mimosaster pallaei* and in 1961 made comparative ecological studies of an anthrabad, *Acarus levipennis* and the bruchid, *Mimosaster pallaei*. Howe and Currie (1964) investigated the life-histories of six species of bruchids breeding in the stored pulses. Kingsolver (1964, 1965) has added to the knowledge of bionomics and host plants of the non-economic species of the genera *Neltumius* and *Abutilonua*. Kingsolver
and Whitehead (1974) worked on the biogeography of the species of genus *Ctenocolum* feeding in the seeds of the legume genera *Fiscidia*, *Lonchochernes*, *Muelleria* and *Bergeronia*. Farnell (1964) studied the external morphology of the larvae and the pupae of *Bruchidius ster.* and later (1966) made observations on its population fluctuations and life history on the broom, *Cerathamnus scoparius*. Revett (1966) while discussing the biology of the genus *Caryedon*, pointed out that the redifferentiation of the legs in the final instar of *Caryedon serratus* is correlated with its habit of emerging from the host seed or pod followed by pupation in a cocoon. He (1967b) described its larva, in (1967a) published some biological observations of six species of Bruchidae, in 1967c gave notes on the biology, food plants and distribution of some Nigerian bruchids and in 1968 described five larval instars of *Iachymerus cardo*, a pest of nuts of palm oil. He (1971) gave the basic descriptions of the larvae of 28 species, belonging to seven genera, including the genus *Bruchidius*. Johnson (1967) gave notes on the systematics, host plants and bionomics of the species of the non-economic genera *Karobruchus* and *Stator*. In 1970, he reported the biogeography of the genus *Acanthoscelides*. Johnson and Kingsolver (1971) described the ecology and life history of *Acanthoscelides guazumae* and *A. guazumicola* which infest *Guazuma tomentosa*. Johnson (1974) made ecological
studies of two species, *Acanthoscelides baboquivar* and *A. kingsolveri* feeding in the seeds of *Indigosora arborescens*. Johnson and Kingsolver (1975) redescribed and made ecological studies on the grape bruchid, *Amblyserus vitcis*. Johnson (1977) published an account of the life history of *Ctenocolum jenseni* in the seeds of *Jassidula mollis* (Leguminosae) whereas in 1978 reported the ecology of *Netumius tenuus* in the seeds of *Condalia* (Rhamnaceae). In 1978, he made observations on the ecology and behaviour of *Acanthoscelides mundulus* in the seeds of *Kissolia schottii* (Leguminosae); Johnson and Slobodchikoff (1979) studied coevolutionary interactions, evolving many adaptations among the 42 species of *Cassia* and 34 species of bruchids mostly of the genus *Sennius*. Forister and Johnson (1970) found that one side of egg is cemented to the pod of *Acacia greggi* and each egg is surrounded by numerous anchoring strands, while working on the bionomics of *Merobruchus julianus*, whereas they (1971) studied the behaviour and ecology of *Acanthoscelides prosopoides* that feeds in the seeds of *Ziziphus obtusifolia* (Rhamnaceae). Fujii (1970) studied the interspecific competition between *Callosobruchus chinensis* and *C. maculatus*. Raina (1970) made comparative study of the biology of 3 species of *Callosobruchus*. In 1971, he described briefly some bruchids as field pests of pulses. Ferttunen and Hayrinen (1970) observed the take-off activities of the adults
of *Acanthoscelides obtectus*. Umeya and Ito (1970) published the ovipositing and the boring behaviour of the first instar larva of *A. obtectus*, later, (1975) noted the intraspecific larval competition in *Callosobruchus analytis*. El-Kifl and Metwally (1971) carried out studies on the biological behaviour of *Bruchidius incarnatus*, a pest breeding in the seeds of broad bean (*Vicia foba*). Frankenhuysen and Herquin (1972) published an account on the mode of life of *Bruchidius atar*, a pod miner on the broom, *Sarothamnus scoparius*, breeding on the developing young green pods in the field. Center and Johnson (1973) gave a comparative account of four species of *Nemonyx* that feed in the seeds of species of *Cassia*; they (1974) while observing coevolution of some bruchids and their hosts, analysed 38 bruchid species and 44 species of the host plants, which revealed many adaptations evolved in these seed beetles. Henry and Rangan (1975) showed that the artificial damage to the bean seeds increases the fecundity rates of *Acanthoscelides obtectus*. Nwane and Horber (1975) noticed the occurrence of the active miniature forms of *Callosobruchus maculatus* from the small sized seeds in the population. Hulgnard (1976) stated that the presence of the beans and mating induces oviposition in the majority of the females of *Acanthoscelides obtectus*. Fajni and Good (1976) published some observations on the biology of *Bruchus pisum*. 
Ffeffenberger and Johnson (1975) described the first instar larvae of 20 species of Bruchidae and discussed their relationships, biology and larval behaviour of each.

The perusal of the literature reveals that very little has been published on the bruchids that infest the host plants with non-edible seeds and pods whereas almost the whole of the work pertains to the species which feed on edible stored seeds or to the forms which attack pulses etc. in the field. This is because of the fact that these bruchid species compete directly with man for his beans, pulses, peas and other valuable legumes. They are, thus, considered as economic pests and consequently, extensive work has been done on their bionomics, biology, ecology, life history and control. It was Johnson and his co-workers referred to earlier, who initiated most of the work on the bruchids which attack the developing young green pods or mature seeds of non-economic host plants or the plants which do not have any apparent food value but may be important in forestry or may be of medicinal or ornamental value. Species of Bruchidius such as B. taphrosiae attacks the weeds Taphrosia purpurea and T. villosa associated with our crops and which take away the valuable nutrients of the crops. This bruchid controls the growth and multiplication of these weeds by feeding on their seeds and rendering them unfit for germination and is thus means of biological control.
It may be mentioned here that the host plant *Techrosia furfuracea*, according to Bamber (1916) has a medicinal value and is used as a diuretic tonic and a laxative. Another species *I. pygomaclatus* attacks *Acacia catechu*, *A. modesta*, *Albizzia lebbek* and *Albizzia procera* which have very hard and durable heart wood and is used for rice pests, sugar-cane and oil seed crushers. The most important product of *A. catechu* is Catechu(Katha), consumed with betel leaf and also used medicinally, according to Kanjilal and Das (1936, 1938). The leaves of *Acacia modesta* are used as cattle fodder and a tasteless gum also exudes from the wounds of its bark. The wood of *Albizzia lebbek* and *A. procera* is exported to America probably along with the wood of other *Albizzia* under the name of East Indian walnut for decorative furniture. *B. sahlbergi* attacks *Acacia farnesiana* grown as fences, whose pods and bark are rich in tannin and are used in the tanning industry, whereas a perfume is made from its flowers. *B. angustifrons* attacks *Acacia sesban* which is often grown as hedges on account of its remarkably rapid growth (Kashyap, 1936).

*B. mimosa* attacks *Mimosa rubicaulis*, whose charcoal, according to Kanjilal and Das (1936), is made into gunpowder & bruised leaves are applied to the burns (Bamber, 1916).

So the plants infested by *Bruchidius* spp., though having no direct food value, may be useful as timber trees,
ornamental or medicinal plants, may have several uses as mentioned above. The present work is an attempt to study the behaviour and life-histories of some of the Indian species of Bruchidius infesting such plants, which have not been dealt with so far.