A survey of Coleopteran pest and beneficial insects was conducted on faba bean fields during 2013-2014 cropping season in two main regions of leguminous production in north Tunisia. Scouting for insects was carried out by beating the plants vigorously into a white plastic container or by using sweep net. 8 families, 11 pest species and 6 predators were identified. Only *Sitona lineatus* and *Bruchus rufimanus* appeared to be main pest insects and they were relatively more abundant in both regions. *B. rufimanus* populations showed seasonal dynamics and adult activity started in faba bean fields in late February. Adult population density reached its highest percentage at the fructification period in mid-April. Significant harmful effects on seed germination, seed weight and infestation were recorded. Broad bean (Chahbi variety) seemed to be more damaged. Incidence of *B. rufimanus* attacks was greater on broad bean than on field bean. Reductions of the percentage of germination were 32.6 and 26.76% for Chahbi and Bachaar varieties respectively. Moreover, weight loss for Chahbi and Bachaar varieties were 7.33 and 9.37%, respectively. Additionally, the percentage of infested seeds was lower for Bachaar variety (25%) than for Chahbi variety (37%). Based on this study, the development of appropriate control strategy against faba bean infesting pests, mainly *B. rufimanus* is required. This will promote new view on the existing and potential control methods by the development of new selective chemicals, screening for new biocontrol agents and the design of new management strategies.

**Keywords**: *Bruchus rufimanus*, faba bean, dynamic, damage.
benefits such as its ability to fix atmospheric nitrogen symbiotically (Köpke and Nemecek, 2010). In recent years, considerable progresses have been made by Tunisian government to improve faba bean (mainly field bean) productivity and yield in order to reduce the import of high costly protein sources for livestock feed characterized by their restricted availability and their unpredictability market (Azaza et al., 2009). However, a large number of biotic and abiotic constraints severely limited the development of this crop. In this respect, diseases, parasites and insect pests are real problems in the field and during storage.

In Tunisia, the insect species and their pest status on faba bean are rudimentary. In Tunisia, the few previous studies achieved reported that the described insect pests belonged to Hemiptera and Coleoptera orders. In this context, Diekmann (1982) and Bouhachem-Boukhris (2002) reported that aphids are major pests and that high Aphids fabae (Scopoli) infestations occurred in the north and Aphis craccivora (Koch) was only found in southern oasis. Similarly, Béji et al. (2013) noticed that the black bean aphid A. fabae is the major constraint of baba bean production in Tunisia. Regarding coleopteran pests, pest status of these insects on faba bean in Tunisia was documented by Weigand and Bishara (1991) reporting Sitona species as main pests of faba bean in the Mediterranean countries including Tunisia. Moreover, Jarraya (2003) indicated that four Sitona species are pests on food legume including faba bean, namely Sitona lineatus (L.), S. crinitus (Herbst), S. humeralis (Stephens) and S. limosus (Rossi). The author signaled that S. lineatus is the more common and injurious pest. In addition, Coers et al. (1983) indicated that the steam borer Lixus algirus (L.) was found in Tunisian faba bean fields at a rate 58.4%. Furthermore, Homem-Bourissa et al. (2010) indicated that L. algirus accomplished one generation per year on faba bean and that region of Cap Bon and Béja presented important infestation rates.

Few studies were reported regarding the broad bean weevil Bruchus rufimanus (Boheman) in Tunisia. In this context, Weigand and Bishara (1991) stated this species as a major Bruchid pest attacking faba bean together with Bruchus dentipes (Baudi). Furthermore, Moalla-Abdennadher (1997) indicated that B. rufimanus is present in all areas where faba bean is cultivated and more frequent in the region of Uitique (North, Tunisia).

In this paper we report results of the first rigorous survey on pest and beneficial Coleopteran insects infesting faba bean in two regions of north Tunisia where faba bean is more sown. We focus on the bean weevil Bruchus rufimanus. We compared its population dynamics and importance of damage on broad bean (Vicia faba Var. major) and field beans (Vicia faba Var. minor) in the above areas.

**MATERIALS AND METHODS**

**Experimental fields**

Trials were led in two V. faba fields: field 1 planted with Chahbi variety (V. faba major), field 2 planted with Bachaar variety (V. faba minor) located in the region of Béja (North-Ouest, Tunisia, 36° 43’ 30" N; 9° 10’ 55" E). This experimental site is one of the areas with the most diversity in food legumes and cereal crops in Tunisia.

Each experimental field occupied an area of 0.5 ha. Sowing was done in December 2013 and no fertilizer or other chemical treatments were applied. The experimental design was a complete randomized block with five replications. Each variety was sown in rows 4 m long, with 0.5 m inter-row spacing. Respectively, thirty-five and fifty seeds were sown at equidistant intervals in each row for Chahbi and Bachaar varieties. The two faba bean varieties characteristics were described in Table 1.

**Survey of Coleopteran insect infesting faba bean (harmful and beneficial insect species)**

One-year survey (cropping season 2013-2014) was carried out in two regions where V. faba is most sown in Tunisia (regions of Bizerte and Béja) to inventory coleopteran insects (pests and beneficial) infesting faba bean. For that, regular sampling was conducted during the period from December to May. Sample size was 20 randomly selected plants per file. Two procedures were adopted for this work: (i) sampling of insects from flowers, leaves and stems by beating the plants vigorously into white plastic containers, (ii) captures using sweep net. Collected insect species were counted in the field by using a hand lens. Insects that could not be identified in

---

**Table 1. Common names, Origin/Pedigree and botanical class of the two faba bean varieties (Ouji et al., 2010)**

<table>
<thead>
<tr>
<th>Common names</th>
<th>Origin/Pedigree</th>
<th>Subspecies</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chahbi</td>
<td>Selection from cross S83182-22/(New Mamoth x Local Tunisian faba bean)</td>
<td>Vicia faba var. major</td>
</tr>
<tr>
<td>Bachaar</td>
<td>Pure line developed from FLIP84-59FB (S82166)</td>
<td>Vicia faba var. minor</td>
</tr>
</tbody>
</table>

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the field were transported to the laboratory. Only adult insects were considered and identified according to the taxonomic keys provided by Balachowsky and Mesnil (1936), Hoffmann (1963), Shomar (1963), Hannothiaux (1965), Önder (1982), Capinera (2001) and Atatkan (2012). Moreover, other collected insect species were identified by using reference material deposited at Laboratory of Biotechnology Applied to Agriculture (Section Entomology), National Agricultural Research Institute of Tunisia.

**Dynamics of B. rufimanus populations**

Population dynamics of *B. rufimanus* was assessed both in fields for adults and eggs and after harvest of seeds for the post embryonic stages. In the field, adults were captured in the flowers, leaves and between leave cornets manually by beating plants and by using a sweep net. Moreover, weekly samples of fifty pods taken from the fields were examined to determine the number of deposited eggs. Regarding the post-embryonic development stages, 150 pods per variety were collected weekly from the beginning of the egg-laying phase on green pods to the pod maturation phase to determine the number of larvae (L1, L2, L3, L4), pupae and diapausing adults. The number of insects present within seeds and the state of their development (different larval instars, pupae or adults) were counted. The number of emerging adults from stored seeds was also determined.

**Effects of B. rufimanus on germination and weight loss of V. faba seeds**

In this part, we evaluate the effects of *B. rufimanus* on germination and weight loss of the two varieties Chahbi and Bachaar. The germination was tested on infested seeds. Each essay consisted of 50 seeds repeated 4 times, covered with cotton soaked in water. A control trial using no infested seeds was performed with 4 replications fifty seeds each. 7 days later, the germinated seeds both in control and infested seeds were counted. Germination rate (%) was calculated as the: (Number of germinated seeds/Total of seeds)*100 (Medjdoub Ben Saad, 2007).

The control of seed weight was made in order to know the effect of *B. rufimanus* on the reduction in seed’s weight caused by the larvae. In this respect, fifty seeds from each variety with four replications were weighted before and 90 days after the launch of the tests. The loss of weight was determined as: [(IW-WF)/IW]*100, where IW: Initial Weight and FW: Final Weight (Boughdad, 1996).

**Infestation rate of B. rufimanus at harvest**

In order to determine the percentage of *V. faba* seeds damage at harvest due to *B. rufimanus*, three replications of 1000 seeds were randomly selected from each field. Each seed was checked for *B. rufimanus* infestation. The percentage of seed damage was calculated by dividing the cumulative number of infested seeds by the total number of samples seeds for each variety. Moreover, the numbers of larvae/seed and adults/seed were counted.

**Statistical analyses**

All data were expressed as mean ± SD. They were analyzed by one-way analyses of variance (ANOVA) using statistica (Statsoft, 1998). Duncan test was applied to the means to detect significant differences at the 0.05 percent level.

**RESULTS**

**Survey of Coleopteran insects on faba bean in two regions of north Tunisia**

Total numbers and abundance (total numbers of individuals from it each species divided by total insect number) of harmful and beneficial insect species in faba bean fields are presented in Table 2. Distribution of insects per families was illustrated in Figure 1.

The total number of Coleopteran insects captured in the region of Bizerte was 187 whereas, for the region of Béja, the total number was 205. As reported in Table 2, various pest and beneficial insect species were identified on faba bean crops in the two sites of north Tunisia. The distribution of pests on the two regions was characterized by quantitative rather than qualitative differences. In both regions, 8 families were described. The majority of insects were ranked in Curculionidae, Chrysomelidae, Coccinellidae, and Nitidulidae, presenting 179 and 195 of the total captured Coleopteran insect species respectively in Bizerte and Béja regions (Figure1). Overall numbers of harmful insects were greater in the region of Béja (181 individuals), meanwhile, numbers of total predatory insects were greater in Bizerte (36 individuals). This could be attributed to frequent chemicals applications in Béja region.

In addition, results indicated that insect pest attacks occurred on faba bean on seedling, vegetative and reproductive parts of plants. The first colonizers were *Sitona lineatus* and *Sitona sp*. species which started infestations at the early seedling stage. Peaks of both pest and beneficial coleopteran insects took place in flowering and fructification periods (from April to May).

Regarding beneficial species, the total collected insects
Table 2. List of harmful and beneficial insect species and their abundance (total numbers of individuals) in faba bean fields in Bizerte and Béja during the cropping season 2013-2014

<table>
<thead>
<tr>
<th>Harmful insects</th>
<th>Bizerte</th>
<th>Béja</th>
</tr>
</thead>
<tbody>
<tr>
<td>Curculionidae</td>
<td></td>
<td></td>
</tr>
<tr>
<td><em>Sitonia lineatus</em> (L, 1758)</td>
<td>70</td>
<td>90</td>
</tr>
<tr>
<td><em>Sitona sp</em></td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td><em>Lixus algirus</em> (Fabricius, 1801)</td>
<td>20</td>
<td>11</td>
</tr>
<tr>
<td>Apionidae</td>
<td></td>
<td></td>
</tr>
<tr>
<td><em>Apion vorax</em> (Herbst, 1797)</td>
<td>3</td>
<td>5</td>
</tr>
<tr>
<td>Cetoniidae</td>
<td></td>
<td></td>
</tr>
<tr>
<td><em>Oxytheria squalida</em></td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td><em>Epicometis hirta</em> (Poda, 1761)</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>Carpophilidae</td>
<td></td>
<td></td>
</tr>
<tr>
<td><em>Eupuraea sp</em></td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Anthicidae</td>
<td></td>
<td></td>
</tr>
<tr>
<td><em>Anthicus ephippium</em> (LaFerté-sénertère, 1849)</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Chrysomelidae</td>
<td></td>
<td></td>
</tr>
<tr>
<td><em>Bruchus rufimanus</em> (Boheman, 1833)</td>
<td>40</td>
<td>60</td>
</tr>
<tr>
<td><em>Bruchus pisorum</em> (L, 1758)</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td>Nitidulidae</td>
<td></td>
<td></td>
</tr>
<tr>
<td><em>Meligethes aeneus</em> (Stephens, 1830)</td>
<td>10</td>
<td>8</td>
</tr>
<tr>
<td>Total</td>
<td>151</td>
<td>181</td>
</tr>
<tr>
<td>Beneficial insects</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Coccinellidae</td>
<td></td>
<td></td>
</tr>
<tr>
<td><em>Coccinella undecimpunctata</em> (L, 1758)</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td><em>Scymnus sp</em></td>
<td>20</td>
<td>10</td>
</tr>
<tr>
<td><em>Coccinella septempunctata</em> (L, 1758)</td>
<td>10</td>
<td>6</td>
</tr>
<tr>
<td><em>Chilocus bipustulatus</em> (L, 1758)</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td><em>Hippodamia convergens</em> (Guérin-Méneville, 1842)</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td><em>Coccinella algerica</em> (Kovar, 1977)</td>
<td>2</td>
<td>4</td>
</tr>
<tr>
<td>Total</td>
<td>36</td>
<td>24</td>
</tr>
<tr>
<td>Total</td>
<td>187</td>
<td>205</td>
</tr>
</tbody>
</table>

Figure 1. Distribution of Coleopteran families in Bizerte (n=187) and Béja (n=205) expressed as percentage during the investigation period was 36 and 24 respectively in Bizerte and Béja. These predators are presented by 6 species namely: *Coccinella septempunctata* (L), *Coccinella algerica* (Kovar), *Coccinella undecimpunctata* (L), *Chilocus bipustulatus* (L), *Hippodamia convergens* (Guérin-Méneville) and *Scymnus sp*. All the predators were ranked in the Coccinellidae family (Table 2). In the region of Bizerte, Coleopteran families are rated to be: Curculionidae (48.12%) > Chrysomelidae (22.99%) > Coccinellidae.
Comparing the species listed in Table 2, it can be observed that on a regional basis, insect pest complexes differ in their numerical species composition rather than the types or groups of pests. High species richness occurred in the region of Béja. Differences between the two regions could be attributed to climatic conditions, cropping systems (rotation with cereal and fallow; planting date, chemical treatments) and varieties.

Concerning the Chrysomelidae family, two species were identified in Bizerte namely *Bruchus rufimanus* and *B. pisorum*, whereas, only *B. rufimanus* was found in Béja. Results of this survey indicated that *B. rufimanus* is the dominating pest on seed and fodder plantations of *V. faba*. Thus, a special focus on its population dynamics, effects on seed germination, weight losses and incidence at harvest were studied.

**Population dynamics of *B. rufimanus***

In Béja region, *B. rufimanus* adults appeared in the field at the end of the winter season when faba bean began to produce pods. Adult density increased progressively and reached peaks by late April (24/04/2014) for Chahbi variety while for Bachaar variety, peak occurred by early April (01/04/2014) (Figure 2). Females laid their eggs on the pods during all the fructification period (from March to end of May). Eggs were deposited both on green and mature pods. During the maximum of oviposition period, the mean number of eggs per green pod attended respectively 37 and 35 eggs/pod for Chahbi and Bachaar varieties. However, for mature pods, the mean percentage of eggs/pod was 20.96% for Chahbi and 0% for Bachaar.

For both varieties, the larval developmental stages started from May till end September. The first instar larvae stage lasted for 6 weeks with respective mean peaks of 1.58 larvae/seed at beginning of June (06/06/2014) for Bachaar and 1.78 larvae/seed at the end
Table 3. Effects of *B. rufimanus* on seed’s germination and weight losses (mean ±SE) of the two varieties Chahbi and Bachaar

<table>
<thead>
<tr>
<th></th>
<th>Chahbi</th>
<th>Bachaar</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Infested</td>
<td>No infested</td>
</tr>
<tr>
<td>Germination (%)</td>
<td>31 ± 5.77 b,B</td>
<td>46 ± 1.41a,B</td>
</tr>
<tr>
<td>Weight (g)</td>
<td>48 ± 1.41b,A</td>
<td>51.8 ±0.11a,A</td>
</tr>
</tbody>
</table>

For each variety, within rows, comparisons were made between infested and no infested seeds regarding germination and weight loss. Means followed by same letter (letter in lowercase) were not statistically different by Duncan test at p < 0.05. Between varieties, within columns, comparisons were made between infested and no infested seeds regarding germination and weight loss. Means followed by same letter (letter in uppercase) were not statistically different by Duncan test at p < 0.05.

Table 4. Effects of *B. rufimanus* on means of larvae per seed, adult per seed (mean ±SE) and infestation at harvest of the two varieties Chahbi and Bachaar

<table>
<thead>
<tr>
<th></th>
<th>Chahbi</th>
<th>Bachar</th>
</tr>
</thead>
<tbody>
<tr>
<td>Larvae/seed</td>
<td>2.08 ± 0.4a</td>
<td>2.04 ± 0.5 b</td>
</tr>
<tr>
<td>Adult/seed</td>
<td>1.28 ± 0.01 a</td>
<td>1.12 ± 0.01 b</td>
</tr>
<tr>
<td>Infestation at harvest</td>
<td>37 a</td>
<td>25 b</td>
</tr>
</tbody>
</table>

Comparisons were made between larvae/seed and adult/seed values of both varieties. Means followed by same letter were not statistically different by Duncan test at p < 0.05.

of May (23/05/2014) for Chahbi. Results reported in Figure 2 indicated that the second and the third instar stages took the longest durations with an average of 97 days for Chahbi and 82 days for Bachaar. The respective peaks occurred on beginning and mid-July for Chahbi with values of 0.8 and 1.44 larvae/seed whereas, for Bachaar, mean values were 1.4 and 0.88 larvae/seed on beginning of July and beginning of August. The last instar larval stage L4 appeared from July to September for both varieties with peaks reaching 0.52 larvae/seed for Chahbi (28/08/2014) and 0.44 larvae/seed for Bachaar (14/08/2014).

The pupal stage occurred from end of July to beginning of October with a peak 0.8 pupae/seed on mid-September (11/09/2014) for Chahbi, while, for Bachaar, it took place from mid-August to October with a peak of 0.38 pupae/seed on August (28/08/2014) (Figure 2). Adult’s emergence from seeds began respectively since September 11th for Chahbi and October 1st for Bachaar.

In summary, this study showed that in north Tunisia, *B. rufimanus* accomplished one generation per year either on broad bean or on field bean. *B. rufimanus* adults colonized faba bean cultures at the beginning of the fructification period and the population density reach its highest percentage in mid-April (Figure 2).

**Effects of *B. rufimanus* on germination and weight loss of *V. faba* seeds**

Results related to *B. rufimanus* effects on germination and weight loss of seeds of both varieties were reported in Table 3. Results showed that the broad bean weevil affects the germination and weight of faba bean seeds. Statistical analyses revealed significant differences in germination and seed weight losses between infested and non-infested seeds for both varieties. Respectively mean numbers of germinated seeds for Chahbi and Bachaar varieties were lower (31 and 36.25) than non-germinated ones (46 and 49.5). Percentages of germination were 92% for non-infested seeds against 69.33% for infested ones for Chahbi variety and 99% for non-infested seeds versus 72.5% for infested seeds for Bachaar variety. Reductions of the percentage of germination were 32.6 and 26.76% for Chahbi and Bachaar varieties respectively (Table 3).

The weight losses for Chahbi and Bachaar varieties were 7.33 and 9.37%, respectively. Results showed significant differences in weight between healthy and infested seeds for both varieties. The mean weight was 48g for infested seeds against 51.8 g for non-infested ones for Chahbi variety, whereas, for Bachaar variety, the mean weight was 29 g for infested grains versus 32 g for healthy ones (Table 3). It appeared that Chahbi variety (*Vicia faba var. major*) was more preferred by *B. rufimanus* than Bachaar variety (*Vicia faba var. minor*). This preference could be attributed in part to genetical differences between the two varieties.

**Infestation rate of *B. rufimanus* at harvest**

Table 4 shows the effect of *B. rufimanus* on seed damage at harvest. Results revealed that the percentage of infested seeds at harvest was significantly different between the two varieties. At harvest, the percentage of...
infested seeds was lower for Bachaar variety (25%) than for Chahbi variety (37%). Statistical analysis revealed significant differences between the two percentages. Additionally, seed damage could also assessed by the number of larvae/seed and adults/seed. In this respect, results indicated that the highest percent of seed damages was recorded with Chahbi than Bachaar. The mean numbers of larvae/seed were 2.08 and 2.04 respectively. Moreover, regarding the number of adults/seed, results indicated that Chahbi variety was more damaged compared to Bachaar variety. Indeed, the mean numbers of adults/seed were respectively 1.28 and 1.12 adult/seed. Results shown in Table 4 revealed that the numbers of larvae/seed and adults/seed were comparable between the two varieties despite the little superiority observed with Chahbi variety. Statistical analysis showed significant differences either between means of larvae/seed or means of adults/seed of the two varieties.

**DISCUSSION**

This paper reported the first exhausted study on Coleopteran pest and beneficial insects infesting faba bean fields in Tunisia. Results indicated that faba bean was attractive to various insect species. 8 families and 17 species were identified in this study. In both regions, nearly 50% of identified species belonged to Curculionidae family (48.12% in Bizerte and 50.24% in Béja). Furthermore, in both regions almost 80% of species were ranged into Curculionidae and Chrysomelidae families (71.11% in Bizerte and 79.50% in Béja). The importance of order Coleoptera as pests infesting faba bean and others pulse crops was well investigated and documented (Capinera, 2002; Cárcamo and Vankosky, 2011; Atakan, 2012). In an earlier study, Simmonds and Greathead (1977) reported that some of the largest groups of vegetable-feeding species are in the large plant-feeding order Coleoptera. These authors also mentioned that specifically taxa such as the families Curculionidae contain many pests. On the other hand, Atakan (2012) reported that Coleopteran insect species were recorded mostly at the flowering stage of plants and their total numbers were slightly greater in early plantings. Additionally, Nuessly et al., (2004) indicated that faba bean offers a rich foraging habitat for several beneficial insects.

Additionally, the seed beetles are best known for their habits of attacking the legume seeds. These insects were highly host-specific (Center and Johnson, 1974) Blaszczyk et al., (1995; Sabbour, 2002).

The broad bean weevil *B. rufimanus* is the most important pest of the genus *Vicia* worldwide (Hofmann et al., 1962) and also in Tunisia (Moalla-Abdennadher 1997; Jarraya, 2003). It is a serious pest of field beans (Bruce et al., 2011). Furthermore, *B. rufimanus* is reported to be the dominating pest on seed and fodder plantations of field bean (Choduliska, 1985; Blaszczyk and Gontarsk-Lacka, 1995).

The unique study on population dynamics carried out in Tunisia showed that *B. rufimanus* hibernated as adults. Its activity occurred between February and June with a peak during April-May (Moalla-Abdennadher, 1997). Moreover, this author indicated that *B. rufimanus* became active when temperature exceeded 15°C. Similarly, our results were in accordance with these latest. Indeed, for both varieties *B. rufimanus* adults started their activity in February (Figure 2) and continued till May with a maximum activity in mid-April. Likewise, in Algeria, Medjdoub-Bensaad et al. (2007) reported that *B. rufimanus* adults began to colonise the *V. faba* cultures in February. Furthermore, increasing temperature and changes in photoperiod in the beginning of spring favor the migration of bean beetle weevil adults from the wintering sites to the *V. faba* culture (Dupont and Hugnard, 1990).

On the other hand, our results showed that *B. rufimanus* induced significant damage both on broad bean (*Vicia faba var. major*: Chahbi variety) and field bean (*Vicia faba var. minor*: Bachaar variety) expressed as reduction of germination, weight loss and percentage of infested seeds. Respective germination reductions were 32.6% for Chahbi and 26.76 Bachaar. Weight (mass) losses and infestation percentages were respectively 7.33 and 37% for Chahbi toward 9.37 and 25% for Bachaar. In this respect, many authors pointed out to an increasing importance of the incidence of attacks by the bean weevils *B. rufimanus* on *V. faba* seeds. Sabbour and E-Abd-El-Aziz (2007) observed that *B. rufimanus* started infestation on broad bean pods in the field. After harvest the infested seeds were transmitted to stores, where development of beetles completed. Additionally, as reported by Kaniuczak (2004, 2006), since larvae of this pest undergo the entire developmental cycle inside the seeds, they cause significant losses of seed mass and decrease sowing and fodder value of seeds. Kaniuczak, (2004) demonstrated that seed damage caused by bean weevil ranged from 18.5% to 28.9% and that the average seed yield ranged from 2.88 t/ha to 6.62 t/ha. Matlosz (1998) also noticed that damage of field bean seeds by bean weevil commonly occurs in production and can constitute from 3% to 70%. Besides, Dupont (1990) observed that 50 to 66% of *Vicia. faba* pods had received eggs of *B. rufimaus* during the fructification period and 25% of the seeds contained bruchid larvae. On the other hand, Szafirowska...
(2012) reported that date of sowing affected both \( B. rufimanus \) feeding and yield quantity. Moreover, Wnuk and Wojciechowicz-Zytko (2010) demonstrated that intercropping broad bean with phacelia (\( Phacelia tanacetifolia \) Benth) reduces the number of broad bean beetles \( B. rufimanus \) and their seed damage. In addition, various previous studies demonstrated that seeds injured by bean weevils are more easily inhabited by phytopathogenic organisms (Sedivy, 1972; Chodulska 1985; Sądej and Żurańska 1986; Niezgodziński 1988; Adamczewski et al. 1992; Ciesielski et al., 1992; Epperlin 1992).

CONCLUSION

In Tunisia, faba bean (broad bean \( Vicia faba \) var. major) and field bean (\( Vicia faba \) var. minor) is a major grain legume crop cultivated on 79.31% of the total leguminous area. This paper reported the first exhausted study on Coleopteran pest and beneficial insects infesting faba bean fields in Tunisia. 8 families, 11 pest species and 6 predators were identified. Additionally, since leguminous seeds are infested by many insects and since bruchids were the most important field and storage insect pests, a particular attention was given to the study of the broad bean weevil \( B. rufimanus \). Thus, this study provides comparative investigations on population dynamics and damage of this pest when feeding on broad or field bean. Significant harmful effects on seed germination, weight loss and infestation were recorded. Broad bean (Chahbi variety) seemed to be more damaged. Incidence of \( B. rufimanus \) attacks was greater on broad bean than on field bean.

This study demonstrated that while faba bean plants hosted many coleopteran insect pest species, only \( Sitona lineatus \) and \( Bruchus rufimanus \) appeared to be main pest insects and they were relatively more abundant in both regions.

Based upon these findings, the development of appropriate control strategy against faba bean infesting pests, mainly \( B. rufimanus \) is required. This will promote new view on the existing and potential control method especially when the government tends to improve the productivity, yield and quality of faba bean crops. The control approach should be seen as an IPM program in which good cultural practices, the judicious use of pesticides, highly targeted chemicals, mechanical control, pollution prevention and best management practices should be combined. Consequently, crucial life cycle periods in relation to faba bean phenology and the importance of \( B. rufimanus \) damage should be further studied. In addition, long-season surveys on all insect pests (all taxonomic orders included) will be useful in order to establish an inventory of insects infesting faba bean and their associated natural enemies. The identification, the monitoring and the seasonal abundance of various specious and their pest statutes will be valuable to establish effective and durable management strategies.

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