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Survey for Identification and Incidence Evaluation of Groundnut Seed Beetle Caryedon Serratus (Olivier) (Coleoptera: Bruchidae) in Some Localities of Rahad Agricultural Corporation, Sudan

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Abstract

Two surveys were carried out in both seasons 2016/17, on the southern zone and 2018/19, on the northern zone at rahad agricultural corporation (rac). Both surveys covered 12 villages on 6 agricultural blocks, from each block two villages were randomly subjected to survey. The main goal of this work was to identify and investigate the abundance and intensity of incidence of groundnut seed beetle caryedon serratus (olivier) (coleoptera: bruchidae) attacking groundnut in some parts of (rac). A random sample of 100 grams was taken from each village and examined for damage symptoms. The obtained results indicated that; generally, on the southern zone, the mean infestation levels, which include eggs (source of infestation), larvae, pupae, adults and exit holes were 1.7, 8.8, 9.3, 7.3, and 15.7, respectively which were relatively higher when compared with the northern zone 0.5, 3.0, 3.0, 4.5, and 6.2, respectively. Also, the presence of molt due to heavily damaged or broken pods was higher on the southern zone when compared with the northern zone. These results definitely attributed to the clear variations in climatic conditions, which depend mainly on the amount of annual rain fall beside relative humidity. Both of these climatic conditions considered as main factors and directly influenced the level of infestation, if found (increase the population of the bruchid). On the other hand, store hygiene (including the use of insecticides) and proper stock management, beside the presence or absence of the alternative hosts play a fundamental role in the spread of infestation process.

Keywords: Survey, Incidence, Rahad, Localities.

Introduction

Groundnut is grown as a cash crop in most areas of Sudan. The rain fed areas in Western Sudan

(Great Kordofan and Darfur States), the irrigated areas in Gezira, Rahad and other agricultural schemes. In most of these irrigated schemes it is grown as a rotational crop. Groundnut is stored either as unshelled pods or as kernels for different uses. Both forms are vulnerable to attack by a plethora of insect pests after harvest. Stored groundnut either pods or kernels are susceptible to insects, fungi and mites in storage. One hundred insect species are reported to attack the stored groundnuts [1]. Of these, eight insect species are of major importance and six are of minor importance. Among them, the groundnut seed beetle Caryedon serratus (Olivier) is a well known pest of economic importance. It has been reported as a pest of international importance of stored groundnuts and wide spread in various groundnuts growing areas of the world [2]. Groundnut seed beetle is regarded as the only species that can penetrate intact pods to infest kernels [3]. The beetle damage not only reduces the weight and nutrient value, but also adversely affects the quality of seeds and oil. Infestation causes loss in dry mass of the kernels, increased levels of free fatty acids in the oil (thereby lowering the quality) and reduction in germination potential [4]. The heat and moisture generated by large insect population within heaps or

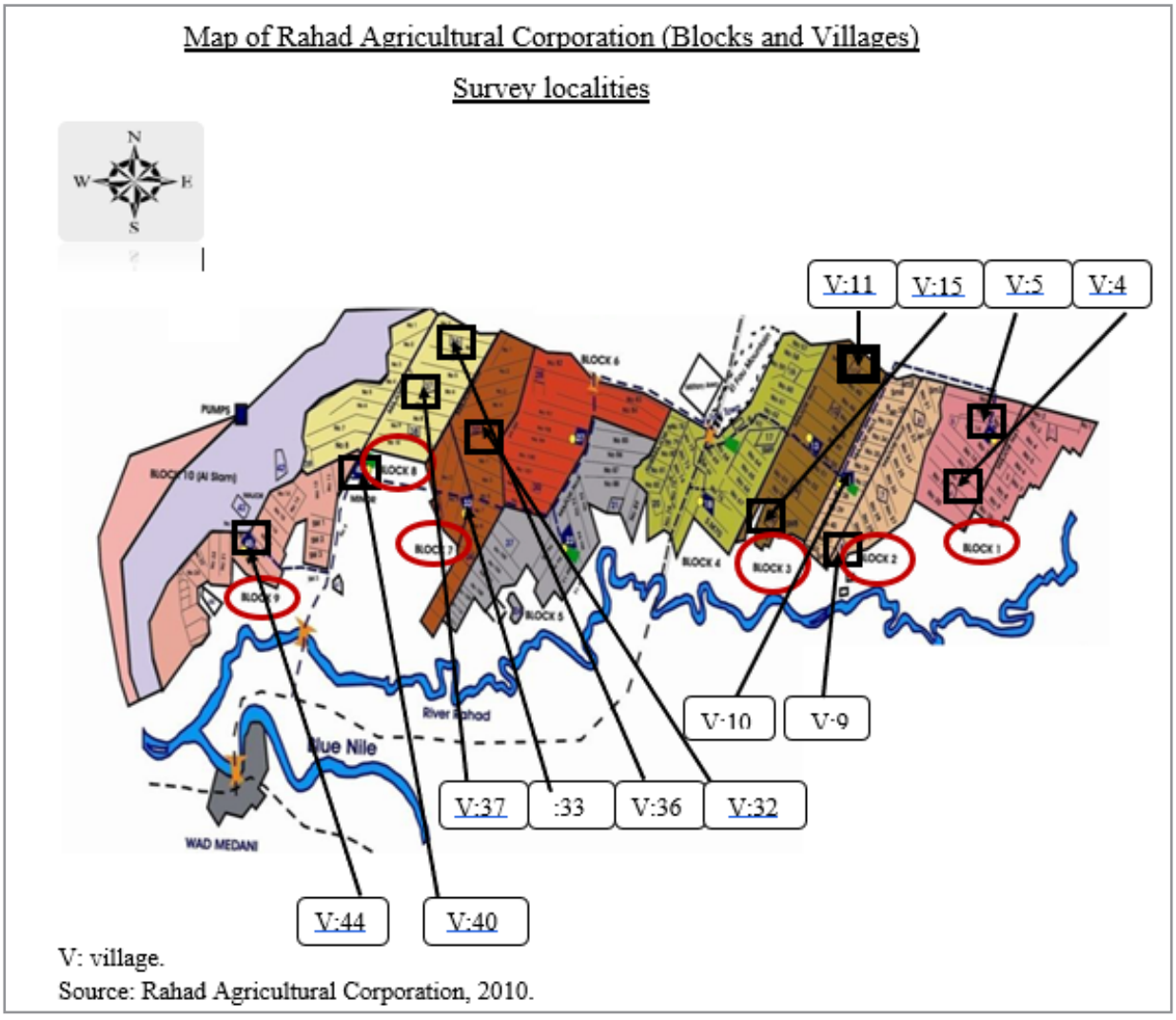
stacks of groundnut may also increase risk of molt growth. The losses in groundnut varied according to the storage period and may vary from 19 to 60 % when the groundnut was stored for five months [5, 6, 3]. The amount of damage inflicted by insect pests during post harvest processing and storage depends on several factors such as moisture content in the product, the form in which it is stored, level of maturity at harvest, sanitation of storage space and the quality of the material itself. In addition, the storage structure also influences the rate of deterioration through its physical environment. Post-harvest processing of groundnuts (threshing, drying and cleaning) has a significant influence on insect behavior and establishment in the store. Mature pods are less susceptible to insect pests than immature pods. Also, undamaged unshelled groundnuts can be stored for long periods without insect pest damage with moisture content below 7% [7].

Materials and Methods

Survey Site

The survey was carried out at Rahad Agricultural Corporation (RAC), which lies east of the Blue Nile on the eastern bank of the seasonal river, "Rahad". It extends between latitudes 13ºand 16º north, and longitudes 22º and 35ºeast. The scheme is located 160 Km, south of the capital, Khartoum. It is a national project established by the Rahad Corporation Law 1972 [8]. Maximum temperature ranging from 34 to 42 ºC and minimum 14 to 23 ºC. The relative humidity varies from 21% in April to 70% in August. The rainfall in the northern parts varies from the southern parts of the Rahad Scheme. The northern part has an annual rainfall average below 300 mm, with a dry period of about eight months, while the southern part has an annual rainfall of above 500 mm, with a dry period of six months [9].

Two surveys were carried out. The first survey was done during 2016/2017 season in the southern zone of the Rahad Agricultural Corporation. The second survey was done during 2018/2019 season in the northern zone. Both surveys were done on the farmer's stores and local markets. At any selected location at least one store was selected, and then a sample of 100 grams of unshelled groundnut was taken randomly from at least two sacks in each store and examined for damage symptoms and immature stages or adult presence. The survey which was done in the southern zone, covered six villages on three agricultural blocks, villages 11 and 15 (Block 3), villages 9 and 10 (Block 2), villages 4 and 5 (Block 1), Table (1). In the northern zone the survey also covered six villages on three agricultural blocks, villages 32 and 33 (Block 7), villages 36 and 37 (Block 8) and villages 40 and 44 (Block 9), Table (2).



V: village.
Source: Rahad Agricultural Corporation, 2010.

Table (1): Number of eggs, larvae, pupae, adults and exit holes on 100 gram of stored unshelled groundnut in some villages in southern zone of Rahad Agricultural Corporation (2016/17 season):

location			Number/100 grams				
Village	Block		Eggs	larvae	pupae	adults	Exit holes
4	1		0	6	8	4	11
5	1		7	11	8	6	14
		Mean	3.5	8.5	8	5	12.5
9	2		0	8	10	7	12
10	2		0	7	11	10	17
		Mean	0	7.5	10.5	8.5	14.5
11	3		0	9	12	7	18
15	3		3	12	7	10	22
		Mean	1.5	10.5	9.5	8.5	20
Grand mean			1.7	8.8	9.3	7.3	15.7

Table (2): Number of eggs, larvae, pupae, adults and exit holes on 100 gram of stored unshelled groundnut in some villages in northern zone of Rahad Agricultural Corporation (2018/19 season):

location			Number/100 grams				
Village	Block		Eggs	larvae	pupae	adults	Exit holes
32	7		0	3	3	3	5
33	7		2	3	2	4	4
		Mean	1	3	2.5	3.5	4.5
36	8		0	3	5	5	7
37	8		0	2	4	5	6
		Mean	0	2.5	4.5	5	6.5
40	9		0	4	2	6	8
44	9		1	3	2	4	7
		Mean	0.5	3.5	2	5	7.5
Grand mean			0.5	3.0	3.0	4.5	6.2

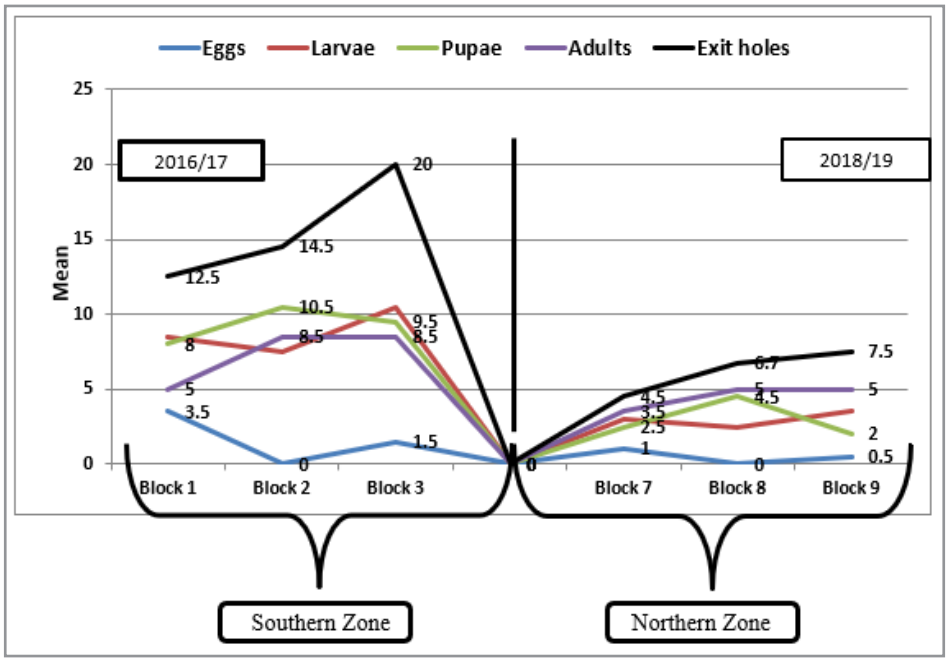


Figure (1): Mean number of eggs, larvae, pupae, adults and exit holes/100 grams of unshelled groundnuts in 2017/18 and 2018/19 seasons in some blocks at Rahad Agricultural Corporation.

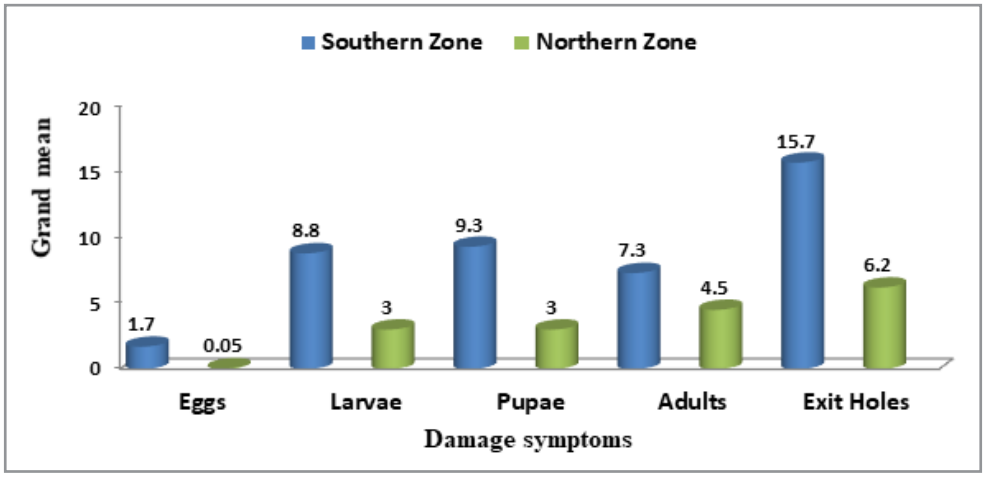
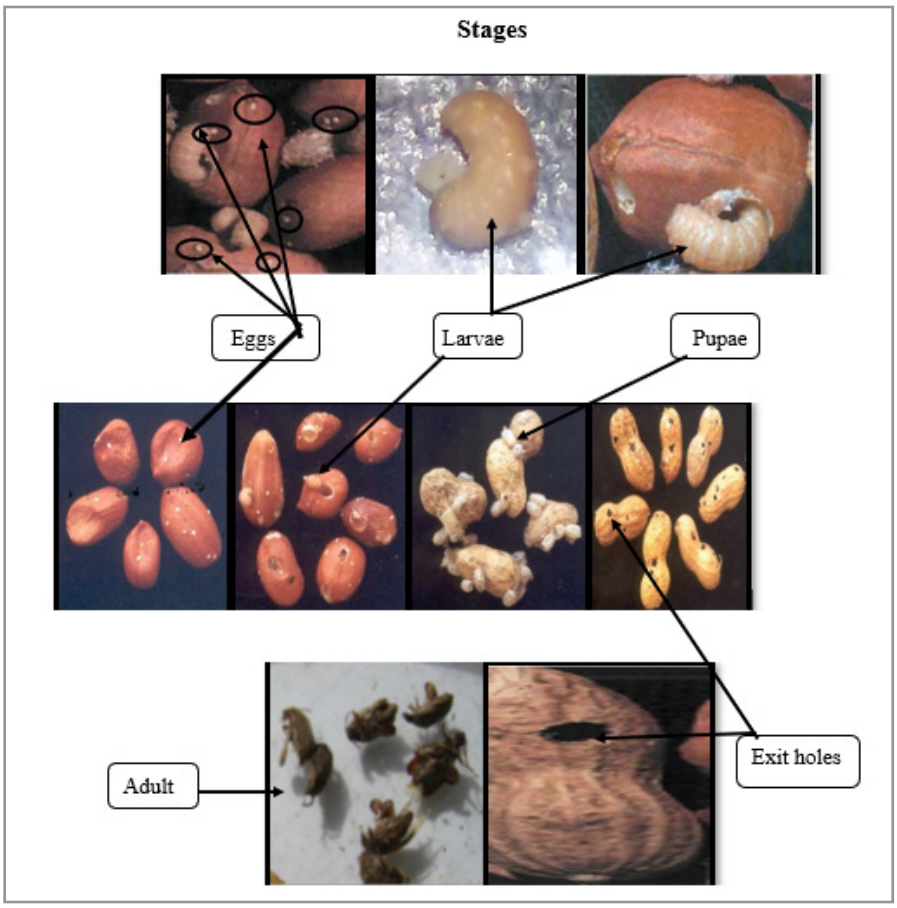
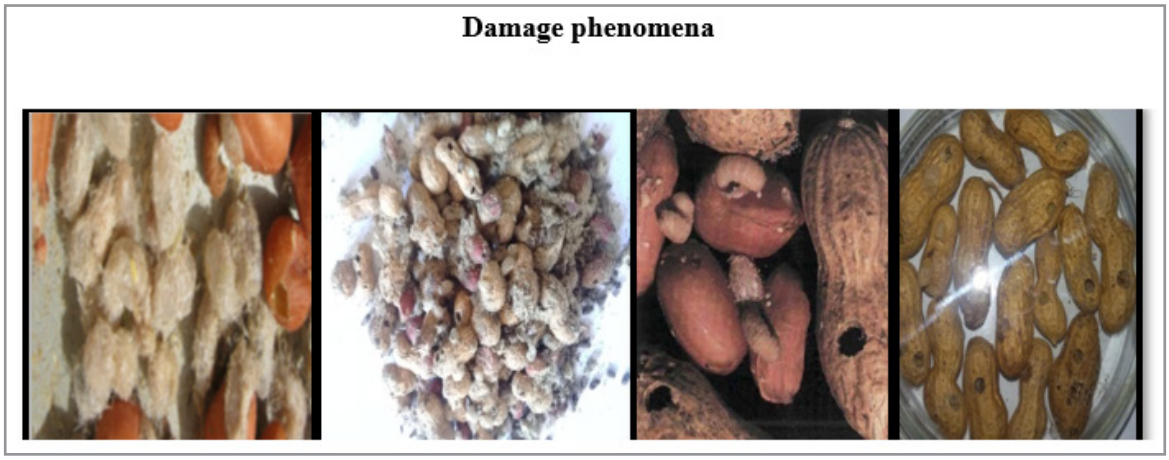


Figure (2): General incidence level of damage phenomena on Southern and Northern zone of Rahad Agricultural Corporation, seasons 2017/18 and 2018/19.

Results and Discussion

Differences in infestation levels between the two zones were detected. These differences may be attributed partly to climatic conditions and partly to storage situation .The survey of stored groundnut for C. serratus on the both zones revealed that; the damage symptoms, which include eggs (source of infestation), larvae, pupae, adults and exit holes were relatively low in the northern zone, when compared with the southern zone. The lower incidence level in the northern zone, probably related to lower annual rainfall (300 mm) with a relatively long dry period, which extended to about eight months. Contrary, the southern zone, which characterized by a relatively higher annual rainfall (500 mm), with a short dry period of seven months. These factors provide optimum environment for acceleration of infestation. The wet environment encourages the eggs hatching, resulting in increasing the population. Also other cultural practices in the field after harvest such as the duration of drying period influence the level of infestation.





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