

**DIET'S STUDY FOR SCHISTOCERCA GREGARIA (FORSKAL, 1775)
(CYRTACANTHACRIDINAE, ACRIDIDAE) AT LEVEL OF BOTH STATIONS
IN REGION OF TAMANRASSET (HOGGAR)**

LAZAR M¹, BENSAAD H², DOUMANDJI-MITICHE B³ & BENZEHRA A⁴

^{1,2}National Institute of Vegetable Protection, Algiers, Algeria

³Department of Agricultural and Forestry Zoology, Agronomic Upper National School, El Harrach Algiers, Algeria

⁴Higher National Agronomic School, Department of Agricultural Zoology, El Harrach, Algiers, Algeria

ABSTRACT

Vegetation interest for desert locust *Schistocerca Gregaria* studied by analyse method of digestive continuous at level of the two stations (Oued Amdad and Oued Arak) situated in region of Tamanrasset (Hoggar) in Algerian South known as zones of reproduction of potentilla closer each other and are different by dominance of various vegetable species which are growing, showed in spite of presence of several vegetable species at level of both stations, diet of solitary locust populations harvested in both study stations is not very varied and only 4 vegetable species at Oued Amdad and 6 ones at Oued Arak had been observed in ingestion of studied individuals. As well, at level of Oued Amdad station, females have consumed 4 vegetable species and males have consumed only 2 among the 12 existing. In station of Oued Arak, females and males have consumed 5 vegetables species on the 10 existing. The most consumed vegetable specie as well as by females and by males in both stations is *Schouwia thebaica*.

KEYWORDS: Desert Locust, Stations, Vegetable, Hoggar, Oued, Tamanrasset

INTRODUCTION

The desert locust (*Schistocerca gregaria* Forsk. 1775) (Figure 1), the 8th Egypt 'sore of the Bible) belongs to family of Acrididae which includes most of locust with short antennae. Locusts are different from grasshoppers because they have capacity to change their behaviour, physiology and morphology, notably of colour and shape, in response to density changes. The winged can form swarms containing until billions of individuals, and which behave as a coherent unity (Symmos et Cressman, 2001). Presently, biology of desert locust is perfectly mastered and their gregarious areas are relatively well settled The most favourable biotopes, known as zones of gregariousness which are preferably to be observed are, usually characterized by sandy or sandy-clayey grounds

Within the framework of a precocious alarm system, they are those zones which may be known better. We must improve potential biotopes, location and cartography of desert locust and have means to check regularly the development of ecologic conditions (rains, vegetation) and appearance of conditions which may favour concentration, reproduction and gregariousness of locust populations For this purpose, study of desert locust's diet in its environment proves to be essential in determination of diet preference This study has been performed on solitary creeks coming from different biotopes of locusts based on comparative analysis of floristic composition of biotope vegetable carpet and the floristic composition of individuals' faeces of solitary desert locust captured on biotope

MATERIALS AND METHODS

In order to check vegetation interest for desert locust, we have studied its diet in two stations situated at Tamanrasset. Although the diet choice depends of tolerances and requirements of each species, locusts present for the most part high diet tolerances and for that reason, are not limited in their food quest (Duranton et al 1982. Realization of this study has required on the ground, use of various material: capture (mowing – net), botanic sampling, (journal paper) and conservation of locust (bowl)

Study Stations

Diet has been studied in two stations situated in region of Tamanrasset (Figure 1) Region of Tamanrasset is situated at about 2100 kms in South of Algiers near Hoggar Massif culminant at 3.000 m. Annual average precipitation recorded on period of 48 years(1965 to 2013) is of 50.78 ± 16.38 mm. This region is located between 20th and 25th parallel and 1.5th and 5th longitude East. Both stations are closer each other and varies by dominance of different vegetable species which are growing. Choice of studies stations has been dictated by presence at the same time of vegetation and Locust.

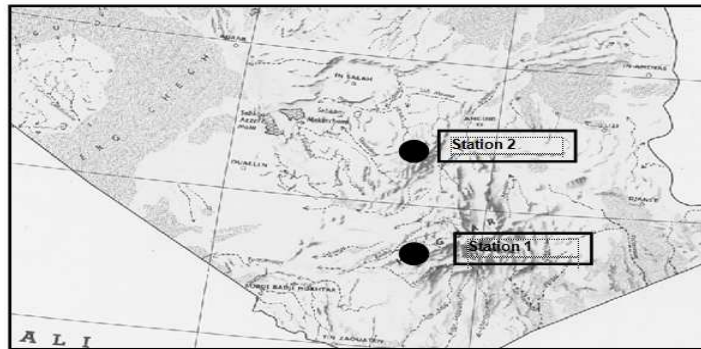


Figure 1: Location of Both Study Stations (1:Oued Ameded and 2: Arak) Sampling of Vegetation and Locust has been made from February, Period with Strong Vegetable and Locusts Activity

The first station situated in the middle of Oued Ameded, contains a vegetable carpet formed of several vegetable species with dominance *Schouwia* (Tableau 1).

Table 1: The Main Vegetable Species Harvested in Oued Ameded

Families	Genders	Species
Crucifères	<i>Schouwia</i>	<i>Schouwia thebaica</i>
	<i>Morettia</i>	<i>Morettia canescenes</i>
	<i>Farsetia</i>	<i>Farsetia hamiltonii</i>
Amaryllidacées	<i>Panicum</i>	<i>Panicum turgiduim</i>
Zygophyllacées	<i>Fagonia</i>	<i>Fagonia glutinos</i>
Cucurbitacées	<i>Colocynthis</i>	<i>Colocynthis vulgaris</i>
Graminées	<i>Aristida</i>	<i>Aristida pungens</i>
Légumineuses	<i>Astragalus</i>	<i>Astragalus vogelii</i>
Euphorbiacées	<i>Psoralea</i>	<i>Psoralea plicata</i>
Boracinacées	<i>Acacia</i>	<i>Accacia raddiana</i>
	<i>Chrozophora</i>	<i>Chrozophora brocchiana</i>
	<i>Heliotropium</i>	<i>Heliotropium undulatum</i>

The second station situated at level of Oued Arak, contains several vegetable species with same level of dominance (Table 2). The ground is sandy-loam, not much deep (table 2)

Table 2: The Main Vegetable Species Harvested in Oued Arak

Families	Genders	Species
Crucifère	<i>Schouwia</i> <i>Farsetia</i> <i>Morettia</i>	<i>Schouwia thebaica</i> <i>Farsetia hamiltonii</i> <i>Morettia canescens</i>
Légumineuses	<i>Psoralea</i>	<i>Psoralea plicata</i>
Amaryllidacées	<i>Panicum</i>	<i>Panicum turgidum</i>
Composées	<i>Cotula</i>	<i>Cotula cinerea</i>
Papilionacées	<i>Astragalus</i>	<i>Astragalus vogelii</i>
Zygophyllacées	<i>Fagonia</i>	<i>Fagonia glutinos</i>
Graminées	<i>Aristida</i>	<i>Aristida pungens</i>
Cucurbitacées	<i>Colocynthis</i>	<i>Colocynthis vulgaris</i>

Analysis Method of Digestive Contents

Analysis of digestive contents is to much used for diet determination of several animal species, notably, in birds (Bigot in Daioz 1972, Aouissi 1991) In mammals Butet, 1976, in locusts (Benhalima et al 1984, 1985, Chaouch, 1994, Kara, 1997, Doumandji-Mitiche et al 1996a, Benfekih, 1993 and Chara 1984, 1987). This method is based on recognition of epidermis fragments of consumed plants contained in the crop or in ingestion, with help of photo-microscope by comparing them to reference epidermises from fresh vegetable sampled in the nature. Basing on numerous characters (shape of stomata, cells lining, phytoliths, hairs, thorns, hook)

- **Preparation of Epidermal Reference**

The preparation of epidermal reference is performed from vegetables species harvested in retained stations in region of Hoggar. Epidermises are removed from underlying tissue of the plant with help of tweezers or by teaselling. They are steeped in bleach water for bleaching during one minute, rinsed in distilled water, then dehydrated in different concentrations of alcohol bath, 75°, 90°, and 100°. The preparation is made between lamina and lamella by adding of Faure liquid. The different epidermises observed through microscope are photographed in order to constitute a reference of epidermal-records collection.

- **Preparation of Faeces**

The captured locusts in the middle of the country have been put individually in plastic boxes and are let about 24 hours without feeding. The faeces given out during that time come from ingestion vegetable in the natural environment. (Figure 2). Collected faeces are separately gathered before to be treated to different experiments.

- Rehydration of ingestion in water during 24 hours
- Soaking in bleach water during 5 to 10 minutes to lighten epidermises
- Soaking of epidermises in distilled water to be rinsed
- Progressive dehydration in alcohol baths of 50°, 75° 100°
- The setting between lamina and lamella of fragments using Faure liquid for conservation of the preparations

- Determination of species consumed by locusts with help of photo-Microscope by comparison of epidermis contained in faeces to those of reference
- Calculation of relative frequency of consumed species

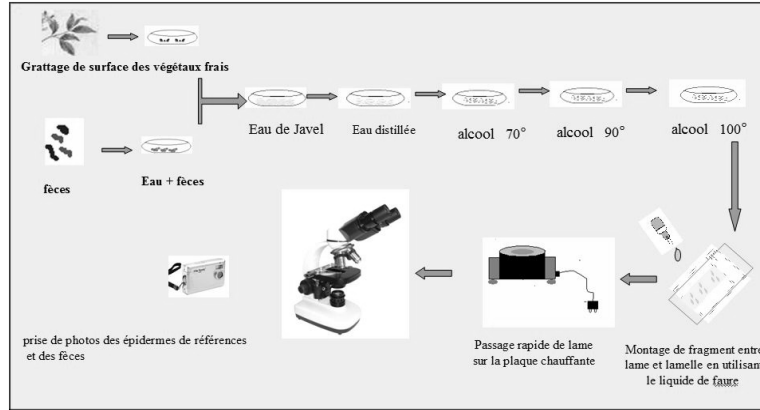


Figure 2: Traitement Et Analyse Des Epidermes De Référence Et Des Fèces

Analysis of digestive contents of 92 individuals from both stations with 67 females and 25 males allowed us the identification of several vegetable species found in faeces. The vegetable species consumed by different individuals are shown in tables 3 and 4 and in figures 4 and 5.

Table 3: Relative Frequency of Consumed Species at Oued Arak

Vegetables Species	Frequency %	Frequency %
	Females	Males
<i>Schouwia thebaica</i>	63	63,5
<i>Astragalus vogelii</i>	22,45	9,7
<i>Psoralea plicata</i>	2,42	8,33
<i>Frasetia hamiltonii</i>	6,45	12,9
<i>Cotula cinerea</i>	-	5,2
<i>Colocynthis vulgaris</i>	3,5	-

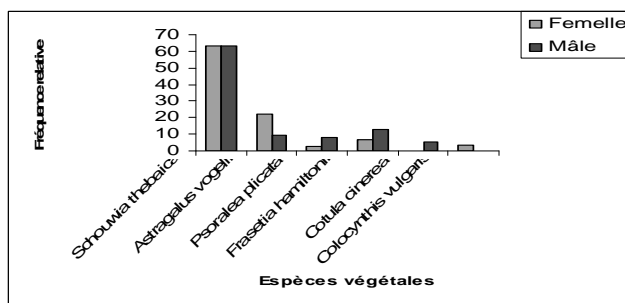


Figure 4: Vegetable Species Consumed at Level of Oued Arak

Table 4: Relative Frequencies of Consumed Species at Oued Amded

Vegetable Species	Frequency %	Frequency %
	Females	Males
<i>Schouwia thebaica</i>	45	44
<i>Chrozophora brocchiana</i>	30	-
<i>Psoralea plicata</i>	2,8	-
<i>Heliotropium undulatum</i>	10,8	20

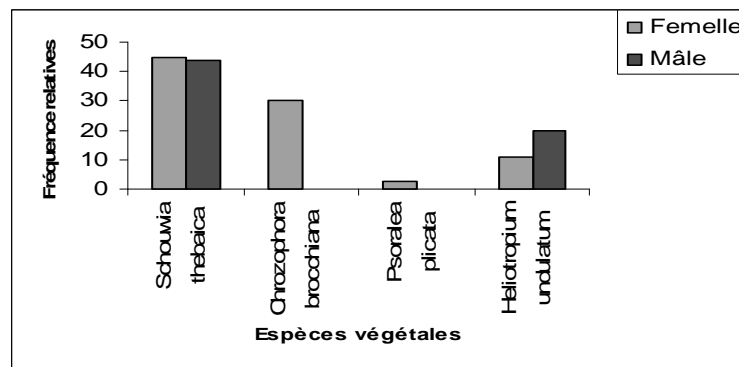


Figure 5: Vegetable Species Consumed at Level of Oued Amded

These graphs show that 4 vegetable species at Oued Amded and 6 other ones at Oued Arak have been observed in ingestion of studied individuals. We have observed at level of Oued Amded that females have consumed 4 vegetable species and males have consumed only 2 among the 12 existing. In station of Oued Arak, females and males have consumed 5 vegetable species on the 10 existing. The vegetable specie the most consumed as well as by females and by males in both stations is *Schouwia thebaica*. This specie is constituted of 44% - 45% of individuals' diet sampled in station of Oued Amded and 63% - 63.5% in station of Oued Arak.

DISCUSSIONS

Populations' diet of both stations is not much varied, locust content themselves of some vegetables species. The same results have been observed by DOUMANDJI-MITICHE et al 1996 by comparing diet of desert grasshopper *Schistocerca gregaria* at Adrar and Tamanrasset. As a matter in fact, they noted in Tamanrasset, females have consumed 8 vegetable species and males only 6. This undeniable fact may be explained by the fact that solitaries do not move by day, consequently, their diet is not too varied. Several studies showed that desert locust in its natural environment gets a diet too much varied. Vegetable species the most consumed are gender of *Schouwia*, *Boerhavia*, *Tribulus*, *Fagonia* and *Panicum* Ghaout, 1990, (Darling, 1934, Zolotareusky and Murat, 1938) in Popov, 1997, Kara, 1997 and Khider 1999). It exists other vegetables species which do not have trophic interest for desert locust as repulsive vegetables, refuge host plants non consumed and toxic plants (DOUMANDJI and DOUMANDJI-MITICHE 1994).

CONCLUSIONS

Locust populations' diet sampled in both study stations of region of Tamanrasset, is not too much varied, locust content themselves of some vegetables species. Females have consumed 4 at Oued Amded and 5 vegetable species at Oued Arak and males have consumed only 2 at Oued Amded and 5 at Oued Arak on a total of existing species in the two stations. The vegetable specie the most consumed as well as by females and by males in the two stations is *Schouwia thebaica*. This specie is constituted of 63% and 44% of individuals 'diet sampled, respectively in station of Oued Amded and Oued Arik.

REFERENCES

1. **Aouissi K, 1991:** *Contribution à l'étude du régime alimentaire du faucon lanier dans la région de Timimoun (Adrar)*. Thèse Ing. Agro, INES Agro. Blida, 48p.

2. **Benfekih L, 1993:** *Données préliminaires sur la sauterelle marocaine Dociostaurus maroccanus (Thunberg, 1815), (Orthoptera, Gomphocerinae) dans la région de Ain boucif (W. Médéa).* Thèse de magister, Inst. Nat. Agro. ; El Harrach, 129 p.
3. **Benhalima T, Gillon Y. et Louveaux A, 1984:** Utilisation des ressources trophiques par *Dociostaurus maroccanus* (Thunberg, 1815) (Orthoptera, Acrididae). *Acta oecologia, oecol. gener*, Vol. 5, n°4, pp 383-406.
4. **Benhalima T, Gillon Y. et Louveaux A, 1985:** Spécialisation trophique individuelle dans une population de *D. maroccanus* (Orthoptera, acrididae). *Acta oecologia, oecol. gener*, Vol. 6, n°1, pp 17-24
5. **Butet A, 1985:** Méthode du régime alimentaire du rongeur polyphage (*Apodemus sylvaticus* L, 1758) par l'analyse microscopique des fèces. *Mammalia*, T. 49, n°4, pp. 445-483.
6. **Chaouch, A, 1994:** *Contribution à l'étude du régime alimentaire de Dociostaurus maroccanus (Thunb, 1815) (Orthoptera, Acrididae) dans la région de Ain Boucif Wilaya de Médéa.* Thèse Ing. Agro. INES, Agro. Blida, 39p.
7. **Chara B, 1984:** *Régimes alimentaires et production des œufs des acridiens dans la nature. Introduction aux méthodes d'étude.* Mémoire D.E.A. Univ. d'Aix-Marseille III, 51 p.
8. **Chara B, 1987:** *Etude comparée de la bioécologie de Calliptamus barbarus (Costa, 1836) et de Calliptamus wattenlyianus (Plenet, 1896) (Orthoptera-Acrididae) dans l'Ouest algérien.* Thèse Doc.Ing. de l'univ. d'Aix-Marseille, 190 p.
9. **Dajoz R, 1972:** *Précis d'écologie.* Ed. Dunod, Paris, 434p.
10. **Doumandji-Mitiche B, Doumandji S, Kara F. Z, Ouchen D. et Mehenni M. 1996a:** Comparaison du régime alimentaire de la sauterelle pèlerine *Schistocerca gregaria* à Adrar et Tamanrasset (Sahara, Algérie). *Med. Fac. Landbouwn. Univ. Gent*, 61/a, pp: 745-752.
11. **Durantou J. F, Launois-Luong M. H, et Lecoq M, 1982:** *Manuel de prospection antiacridienne en zone sèche.* Ed. GERDAT, TI, France, 706 P.
12. **Durantou J. F, et Lecoq M, 1990:** *Le criquet pèlerin au Sahel.* Colle. Acrido. Opératio, n°6, CILSS-DFPV, Niamey, Niger, 183 p.
13. **Ghaout S, 1990:** *Contribution à l'étude des ressources trophiques de (Schistocerca gregaria Forsk. Orthoptera, Acrididae) solitaire en Mauritanie occidentale et télédétection de ses biotopes par satellite.* Thèse Doc. Sci, Orsay, 201 p.
14. **Kara F. Z, 1997:** *Etude de quelques aspects écologiques et régime alimentaire de Schistocerca gregaria (Forsk, 1779) (Orthoptera – Cyrtacanthacridinae) dans la région d'Adrar et en conditions contrôlées.* Thèse de magister, Inst. Nat. Agro, El Harrach, 182 p.
15. **Khider B, 1999:** *Biométrie, régime alimentaire et répartitions des zones de reproduction du Criquet pèlerin Schistocerca gregaria Forskal, 1775 (Orthoptera – Cyrtatacanthacridinae), au sud algérien.* Thèse de magister, Inst. Nat. Agro, El Harrach, 149 p.
16. **Launois- Luang M. H et Popov G. B, 1992:** *Schistocerca gregaria (Forsk, 1775), Acrididae – Cyrtacanthacridinae .* Ed. Ent, France, 91 (3-4), pp. 73-86.

17. **Pedgley D. E, 1972:** *Use of satellites and radar in locust control in Environmental remote sensing: application and achievements.* Centre for Overseas Pest Research, Overseas Development Administration, London, pp 145-152.
18. **Symmos P. M. et Cressman K, 2001:** *Directives sur le Criquet Pèlerin.* Vol. 1, Biologie, FAO, Rome, 43 p.
19. **Uvarov B. P, 1966:** *Grasshoppers and Locusts.* A handbook of General acridologie. Vol. I, Cambridge Univ.Presse, 481p.
20. **Uvarov B. P, 1977:** *Grasshoppers and Locusts.* A handbook of General acridologie .Vol I, London, Centre for Overseas Pest Research, 613 p.

