

dried material in the field, we attempted to use freeze-dried plants as food, the insects being supplied with water separately. The main point is to supply the insect with enough water. Normally, fresh food plants provide enough water for their requirements but in drought conditions some acridids have been seen, in nature, drinking free water; in laboratory rearing, locusts easily suck the wet cotton given to supply them with water. Locusts are known to drink in relation to their water requirements (Bernays, 1977).

MATERIALS AND METHODS

To test usefulness of lyophilised plants as food, we conducted experiments with *Locusta migratoria migratorioides* from Mali reared in the laboratory on their usual food, provided for 37 generations; this consists of 10 cm wheat seedlings grown on a seed-bed. Enough seedlings were lyophilised at the same time to feed 40 locusts for the whole period of the experiment. Freeze-dried wheat was kept in aluminium foil or in plastic bags in a vacuum desiccator.

Newly hatched hoppers were individually separated into two groups, one group fed on freeze-dried wheat and the other as a control, fed with young fresh wheat seedlings whose water content is about 87%. Each of these groups consisting of 15 males and 15 females was reared in a meshed cage of 3 dm³; for fifth instars we have done individual rearings of five males and five females in meshed cages of 0,9 dm³.

Mass and individual rearings on fresh and dry food were conducted together in the same thermoregulated cabinet at 30° with constant light and 60% r.h.

The locusts were observed from hatching to adulthood. Water was given on cotton to insects which had access to dried food. To supply enough water for a

TABLE I

Percentage mortality during hopper development.

		Instars					Total mortality
		I	II	III	IV	V	
Fresh wheat seedlings	15 ♂	10	3	3	0	0	16.0 %
	15 ♀						
Freeze-dried wheat seedlings	15 ♂	6.6	3	6.6	0	0	16.2 %
	15 ♀						

as approximate digestibility A.D. (= A/c) and efficiency of conversion of digested food to body substance E.C.D. (= P/a).

Mortality was the same on dry and fresh seedlings and mainly affected 1st instar.

Females laid one to five egg pods with 50-80 eggs each in both cases. They were kept for a second generation. On dry food, fertility is less but no investigations have yet been done to find the reasons for this.

Food intake is similar to the control (Table II) in spite of the modification in phagostimulation:

— The lack of the water which is considered as phagostimulant (Sinoir, 1968, Barton-Browne & Van Gerwen, 1976).

— The eventual disappearance of leaf volatiles or "green odors" (Visser & Avé, 1978).

— The clamping of enzymatic mechanisms which may act as defense in plants (Aspirot, 1979).

Utilisation of the freeze-dried food noted by the ratio A/c is not different from the controls. The ratio P/a shows that conversion of the digested food, calculated from individual data was somewhat variable, results being dissimilar in males and females.

Feeding locusts with dry food over several weeks can greatly reduce body water content of the insects and their food intake, but as they have access to free water,

RÉSUMÉ

ALIMENTATION DU CRIQUET SUR PLANTES LYOPHILISÉES, UNE NOUVELLE METHODE D'ELEVAGE POUR LES INSECTES HERBIVORES

Pour expérimenter conjointement sur la valeur nutritive de plantes à différents stades d'évolution, il a été tenté de réaliser des élevages de *Locusta migratoria* sur nourriture lyophilisée.

La comparaison d'individus élevés depuis l'éclosion sur blé germé lyophilisé avec des individus nourris de blé germé frais montre que le dessèchement de l'aliment n'affecte guère ni le développement, ni la reproduction dans la mesure où l'eau de boisson est fournie en quantité suffisante.

Cette méthode permet en outre de mesurer la consommation et l'efficacité de conversion de la nourriture ingérée avec bien plus de précision qu'il n'était possible jusqu'ici avec des aliments frais.

REFERENCES

- ANGLADE, P. (1962). Premiers essais d'utilisation de maïs lyophilisé dans l'alimentation des chenilles de Sésamie: *Sesamia nonagrioides* Lef. (Lep. Noctuidae). *Bull. Soc. Ent. Fr.* **67**: 25—28.
- ASPIROT, J. (1979). Consommation par *Schistocerca gregaria* (Forsk) (Orthoptère Acrididae) d'une plante normalement délaissée; *Pteridium aquilinum* (Fougère Dennstaedtiaceae): Action de phagostimulants et étude de la valeur alimentaire de la plante. Thèse de Doctorat de 3ème cycle, Université Paris XI, Orsay, 100 pp.
- BARTON-BROWNE, L. & VAN GERWEN, A. C. M. (1976). Regulation of water ingestion by the locust *Chortoicetes terminifera*: the effect of injections into the haemolymph. *Physiol. Ent.* **1**: 159—167.
- BERNAYS, E. A. (1977). The physiological control of drinking behaviour in nymphs of *Locusta migratoria*. *Physiol. Ent.* **2**: 261—273.
- GILLON, Y. (1970). Caractéristiques quantitatives du développement et de l'alimentation d'*Orthochtha brachynemis* Karsch 1893 (Orthoptera, Acridinae). *La Terre et la Vie* **24**: 425—448.
- LEE, R. M. (1961). The variation of blood volume with age in the desert locust (*Schistocerca gregaria* Forsk.). *J. Insect Physiol.* **6**: 36—51.
- LOUVEAUX, A. (1977). Capacité de régulation de la prise de nourriture et du développement de larves de 5ème stade de *Locusta* dans différentes conditions de jeûne et de température. *Ann. Nut. Alim.* **31**: 85—103.
- PETRUSEWICZ, K. & MACFAYDEN, A. (1970). Productivity of terrestrial animals, principles and methods. *I.B.P. Handbook* **13**: 190 pp.
- SINOIR, Y. (1968). Etude de quelques facteurs conditionnant la prise de nourriture chez les larves du criquet migrateur, *Locusta migratoria migratorioides* (Orthoptera, Acrididae). I. Facteurs externes. *Ent. exp. & appl.* **11**: 195—210.
- TIRA, R. & LE BERRE, J. R. (1976). Influence d'une alimentation artificielle de type méridique sur divers caractères biologiques du criquet pèlerin *Schistocerca gregaria* Forsk. *C. R. Acad. Sc. Paris* **282**: 473—475.
- VISSER, J. H. & AVÉ, D. A. (1978). General green leaf volatiles in the olfactory orientation of the colorado beetle, *Leptinotarsa decemlineata*. *Ent. exp. & appl.* **24**: 538—549.
- WALDBAUER, G. P. (1968). The consumption and utilization of food by insects. *Adv. Insect Physiol.* **5**: 229—288.

