INSECT DIET FORMULATIONS AND METHODS FOR REARING INSECTS

REFERENCE TO RELATED APPLICATION

This application claims the benefit of U.S. Provisional Application No. 60/969,003, filed 30 Aug. 2007, which is incorporated herein by reference in its entirety.

BACKGROUND OF THE INVENTION

The present invention relates to a composition suitable for the preparation of insect diet formulations, containing proteins, carbohydrates, vitamins, salts, and lambda carrageenan; the composition contains maltodextrin and no agar. In addition, the present invention relates to an insect diet formulation, containing the composition described herein and water (room temperature). Furthermore, the present invention relates to a method for rearing insects from eggs, involving providing the insect diet formulation described herein and culturing the insects with the insect diet formulation.

The present state of the art in producing solid artificial diets for insects and mites depends on the use of agar which must be mixed at high temperatures (90-95° C.). Agar has been extensively used in solid artificial diet formulations due to the lack of other alternatives. Although agar based diets are reliable, diet preparations using agar are complicated by the high temperature required to suspend it in water and to maintain its liquid state (55-60° C.) and to prevent solidification. Mixing critical nutrients (e.g., vitamins) into an agar based diet formulation requires very precise timing prior to the threshold of diet solidification in order to prevent the thermal breakdown of these critical nutrients. If this is not done correctly some nutrients may lose activity resulting in the compromised quality of the insects reared on these diets.

There thus remains a need in the art for an effective insect diet formulation that does not require high temperatures during the mixing process and for a method for culturing insects from the egg stage to adult. The present invention described below provides an insect diet formulation, completely devoid of agar, which enables rearing of many different species of insects which is different from prior art media which required the use of agar and high temperatures for mixing.

SUMMARY OF THE INVENTION

In accordance with the present invention, there is provided a composition suitable for the preparation of insect diet formulations, containing proteins, carbohydrates, vitamins, salts, and lambda carrageenan; the composition contains maltodextrin and no agar. Also in accordance with the present invention, there is provided an insect diet formulation, containing the composition described herein and water (room temperature). Additionally in accordance with the present invention, there is provided a method for rearing insects from eggs, involving providing the insect diet formulation described herein and culturing the insects with the insect diet formulation.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** shows analysis of variance and mean comparison of development time in days among *T. ni* reared on colloidal diet for one and 10 generations and in the BioSery diet. Rhombs middle line represents means, rhomb height represents confidence intervals, rhomb width represent number of observations and points represent observation values. Circles represent results of the Tuke-Kramer HSD test, overlapping circles correspond to means that are not significantly different.

FIG. **2** shows analysis of variance and mean comparison of pupal weight in mg among *T. ni* reared on colloidal diet for one and 10 generations and in the BioServdiet. Rhombs middle line represents means, rhomb height represents confidence intervals, rhomb width represent number of observations and points represent observation values. Circles represent results of the Tuke-Kramer HSD test, overlapping circles correspond to means that are not significantly different.

FIG. **3** shows analysis of variance and mean comparison of total number of eggs per female among *T. ni* reared on colloidal diet for one and 10 generations and in the BioSery diet. Rhombs middle line represents means, rhomb height represents confidence intervals, rhomb width represent number of observations and points represent observation values. Circles represent results of the Tuke-Kramer HSD test, overlapping circles correspond to means that are not significantly different.

FIG. **4** shows analysis of variance and mean comparison of total number of eggs per female among groups of *L. hesperus* reared on colloidal diet for one and 5 generations and in the NI (Cohen 2000) diet (Cohen, A. C., J. Entomol. Sci. 35(3): 301-310 (2000)). Rhombs middle line represents means, height represents confidence intervals and points represent observation values. Circles represent results of the Tuke-Kramer HSD test, overlapping circles correspond to means that are not significantly different.

FIG. **5** shows analysis of variance and mean comparison of number of viable eggs per female among groups of *L. hesperus* reared on colloidal diet for one and 5 generations and in the NI (Cohen 2000) diet. Rhombs middle line represents means, height represents confidence intervals and points represent observation values. Circles represent results of the Tuke-Kramer HSD test, overlapping circles correspond to means that are not significantly different.

DETAILED DESCRIPTION OF THE INVENTION

The present invention concerns a composition suitable for the preparation of insect diet formulations, containing proteins, carbohydrates (e.g., starch, cellulose, sugars), vitamins, salts, and lambda carrageenan; the composition contains maltodextrin and contains no agar. In addition, the present invention concerns an insect diet formulation, containing the composition described herein and water (room temperature); the formulation contains no agar and is prepared without heating (at room temperature). Furthermore, the present invention concerns a method for rearing insects from eggs, involving providing the insect diet formulation described herein and culturing the insects with the insect diet formulation.

The insect diet formulation differs from current formulations in part by the use of less water. For example, current formulations need between 75% and 85% water (U.S. Patent Application 20040228947) while our insect diet formulation requires only about 53% water for solid diets. Furthermore, unlike current formulations, no heat is required in the preparation of the insect diet formulation and no water retaining agents are required (which reduces the content of compounds that are not related to insect nutrition thus allowing for the incorporation of more nutrients, especially protein, to end up with a more balanced diet).

Current insect diet formulations using kappa carrageenan require about 70° C. heat and a calcium salt in order to form a stable gel (Spencer, N. R., et al., Ent. Exp. & appl., 20: 39-42 (1976)). Other diets using kappa carrageenan (U.S. Patent Application 20040228947) require the addition of vermicu-