

Integrated Control for Dubas Bug of Date Palm in Iraq

Source of technology/funding	Research conducted by Iraqi scientists from the Ministry of Agriculture, in collaboration with the International Center for Agricultural Research in the Dry Areas (ICARDA) and financed by IFAD.
Expected Benefit:	Improved incomes for smallholder farmers and reduced health risks from insecticides.
Targeted Groups:	Small holder farmers of date palm orchards in central and southern parts of the country.
Production Systems:	Irrigated date palms.
Agro-ecological zones:	Arid and semi-arid zones.
Target country	Iraq
Keywords	Date palm, IPM, Dubas bug, small farmers, Iraq, irrigated lands.

Introduction:

Historically, Iraq was considered one of the most significant producers and exporters of dates. However, during the past two decades date production and the number of date trees have decreased dramatically as a result of harsh conditions and the mismanagement of date palm orchards. In addition, these problems have been compounded by heavy damage inflicted by insect pests, and low market prices. World statistics indicated that Iraq moved down the rankings of world date producers – from fifth in 2005 to seventh in 2010. The contribution of Iraqi dates to the international market also decreased to 6% during the same period. It was estimated that the number of date palm trees was 12 million in 2009, covering 125,000 ha and a total production of 507,000 tons (60 to 80 kg/tree). The governorates of Basra, Karbala, Babil, Baghdad, and Diyala are the major producers of date palm in Iraq, with nearly two thirds of Iraq's dates grown in these areas. A report prepared by the "International Food Program" in 2003 indicated that Iraq's consumption of pesticides for insects and weed control may reach up to 6000 metric tons annually. These chemicals would be minimized with the implementation of an Integrated Pest Management (IPM) program. Substantial efforts to rehabilitate date palm cultivation are made by the Government through the implementation of projects that aim to expand the cultivated areas of date palm and

increase productivity. The latter is linked with the use of improved practices that prioritize the minimum use of pesticides. The present project addresses the introduction of an IPM package (Neem as a safe botanical insecticide and the use of bio agent, *Beauveria bassiana*) in managing the Dubas bug, one of the major insect pests threatening date palm in Iraq.

Project Brief:

- Grant and Funds**
 The project is funded by IFAD and supported by in-kind contribution from the Centre for Organic Farming, Ministry of Agriculture.
- Linkages**
 The project is part of on-going project entitled "Improved Livelihoods of Small Farmers in Iraq through Integrated Pest Management and Organic Fertilization," which focuses on wheat, chickpea, and date palm.
- Time period**
 The time period of the project was from 2009 to 2012, covering four years of data collection and on-farm experiments.
- Objectives:**
 The overall objective of the project was to develop and adopt effective IPM options for the control of Dubas Bug on date palm. (Fig 1)

The specific objectives are:

- The development of sampling procedures for Dubas bug.
- The on-farm assessment of Neem and Summer oil efficacy for Dubas bug managements.
- Testing the efficacy of *Beauveria bassiana* for the control of Dubas bug.

• Location

The date palm orchards of smallholder farmers in Baghdad and Karbala Governorates.

Beneficiaries:

Smallholder farmers and sustainable date palm plantations.

Rational:

Dubas Bugs (*Ommatissus lybicus*) are a major date palm pest in many Middle East countries, including Iraq. Infestation by Dubas spreads in most Iraqi governorates but its severity is mostly concentrated in central governorates: Babel, Wassit, Dyala, and Baghdad. The insect's spread is largely affected by prevailing climatic conditions. The severity of infestation varies from area to

area, and seasonally, due to differences in agricultural practices. For the last 50 years Dubas control has been the key priority of the annual central control program of epidemic pests, implemented by the Ministry of Agriculture, which depends solely on the use of chemical pesticides through aerial or ground sprays. The estimated area sprayed each year reaches nearly 60,000 ha. The ecological and economic consequences of using pesticides have been significant. These have included population outbreaks of Dubas, the conversion of secondary insects to major pests, the destruction of natural enemies, and un-measurable health and environmental risks. Furthermore, the over use of chemical insecticides during past decades has reduced the effectiveness of chemical control on Dubas Bugs. Thus, the search for alternative measures to ongoing conventional chemical control is inevitable, particularly botanical insecticides and bio agents. Alternative methods have been successful in their attempts to control insects, as well as being environmentally-friendly. This Project addresses major areas that are considered high priority for sustainable agricultural development, namely, the integrated management of major pests affecting date palm production systems in the central governorates of Iraq.

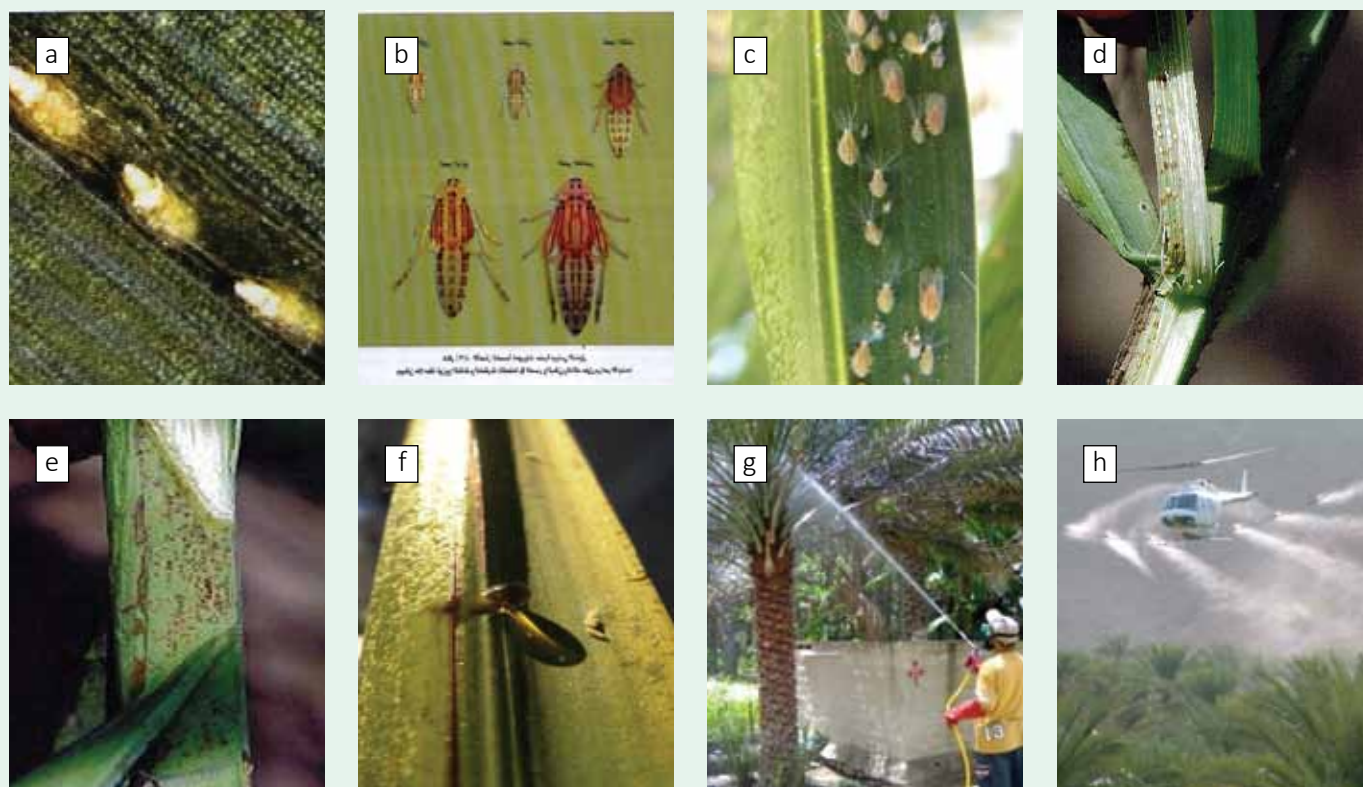


Fig.1. Dubas insect stages, damage on plant tissues, and spraying (areal and ground) of Neem.
A. Eggs in leaflet | B. Five nymphal stages | C. Adult and nymphal stages on leaflet | D. indirect damage on leaf
E. Tissue damage on leaflet | F. Honey dew on leaflet | G. ground spray | H. aerial spray

Output(s)

IPM options for the management of Dubas Bug available for use by farmers.

Methodology:

To determine sample size, some basic preliminary data are necessary, particularly date palm variety. Thus an orchard of 164 ha was chosen to assess the effect of variety on the distribution of Dubas eggs on frond levels. A set of five palms (replicates) of var. Zahdi were selected randomly from different locations of the orchard. From each replicate, 100 leaflets were randomly withdrawn. Collected samples were taken in plastic bags to the laboratory to record the infestation data under stereomicroscope. A similar procedure was used on another set of palm trees, which were sampled randomly regardless of the variety. Least significant difference (LSD) of means was used to compare treatments means.

For the on-farm assessment of Neem, orchards of 25 ha each were chosen at Ain- Alttamer, Karbala Governorate. Infestation levels were determined prior to treatment by randomly selecting five palm trees from five locations (north, south, east, west, and center). Samples of 100 leaflets were selected from each replicate; five leaflets from the four middle levels from each of the four major directions. To avoid the escape of nymphs during the removal of leaflets, the number of insects was recorded visually. Then the orchard was sprayed with insecticide at a rate of 2.5 mL/L using a wheel barrel sprayer (100 L). The Dubas nymphal population was monitored after 10, 14, and 21 days post treatment.

The efficacy of selected bio-pesticides against Dubas eggs and nymphs was also assessed. A date palm orchard of an area of two ha was chosen to be the site for conducting the experiments. The orchard was divided into several plots equal to the number of treatments. Each treatment consisted of 27 palm trees. Dubas egg infestation level was recorded prior to spraying by randomly collecting 100 leaflets from three replicates. Leaflets were withdrawn from the middle frond's levels from the four major directions of each replicate. A similar method was used to monitor nymph populations, but four fronds were removed from each palm and data recorded from 100 leaflets for each treatment. Treatments were *Beauveria bassiana* (two products, local and commercial), *Verticilium lecanii*, *Metarhizium sp.*, *Trichoderma sp.*, and Neem plus Summer oil. The bio-pesticides were sprayed at a rate of 5 g/L, while the Neem and Summer oil dose was 2.5 mL/L. A wheel barrel sprayer (100 L) was used to deliver the bio-agents to palm trees. Eggs and nymph densities were

monitored after 7, 14, 21, and 28 day intervals post treatment. Treatment means were compared using the LSD test. The effect of Neem (1% Azadirachtin) was also tested on Dubas bug eggs in Baghdad, using two application rates (2 and 3 mL/L).

Main results:

Data on Dubas infestation and date palm varieties indicated significant differences between some frond's level in relation to variety, particularly Level one and Level four. Although it is hard to generate a conclusion from preliminary data, the variety has a significant effect on the level of infestation. Further investigation is inevitable, but our data suggest prevailing variety in an orchard has to be considered as the sampling unit for Dubas infestation map determination. On-farm data from Ain-Altammar, Karbala Governorate, showed that the efficacy of natural product Neem had a significant reduction in Dubas nymph populations where the average number of nymphs was 21/ leaflet at pretreatment stage, which was reduced to 9.1 after 10 d, 5.2 after 14 d, and 3.0 after 21 d. Based on these good results, the MoA has launched a control campaign - called Clean Control Campaign- against Dubas by using Neem through both ground and aerial sprays. Results were very satisfactory. Furthermore, the MoA successfully repeated the same campaign during the following autumn and spring generations by aerial spraying of thousands of hectares of date palm plantations using "Neem" as the main product. This is a considerable achievement for the country, and also for farmers.

As an integral part of our center strategy to develop a national integrated system against Dubas bug, the efficacy of several bio pesticides had significant effects on both eggs and nymph stages. The best and consistent results were obtained from both local & commercial *Beauveria* products, followed by *Verticilium*, Neem, and Neem mixed with summer oil (Figures 2 and 3). *Trichoderma* and *Metarhizium* showed the lowest effect on the insect's stages. Also, our large scale field evaluation data indicated the possibility of reducing the cost of Dubas control significantly by replacing 50% of the Neem with summer oil without affecting its efficacy.

Data collected from orchards covered by the Neem campaign (using different concentrations) showed significant reduction in pest populations. There was a significant effect of Neem on Dubas eggs, particularly the concentration 3 mL/L, which caused 95% mortality after 18 days of treatment. The lower dose of Neem, *Beauveria sp.*, and *Trichoderma sp* were less effective. We are planning to continue our investigation on the role of Neem and other bio pesticides on Dubas control programs. Similarly, an intensive research will be conducted to develop a scientifically based monitoring system.

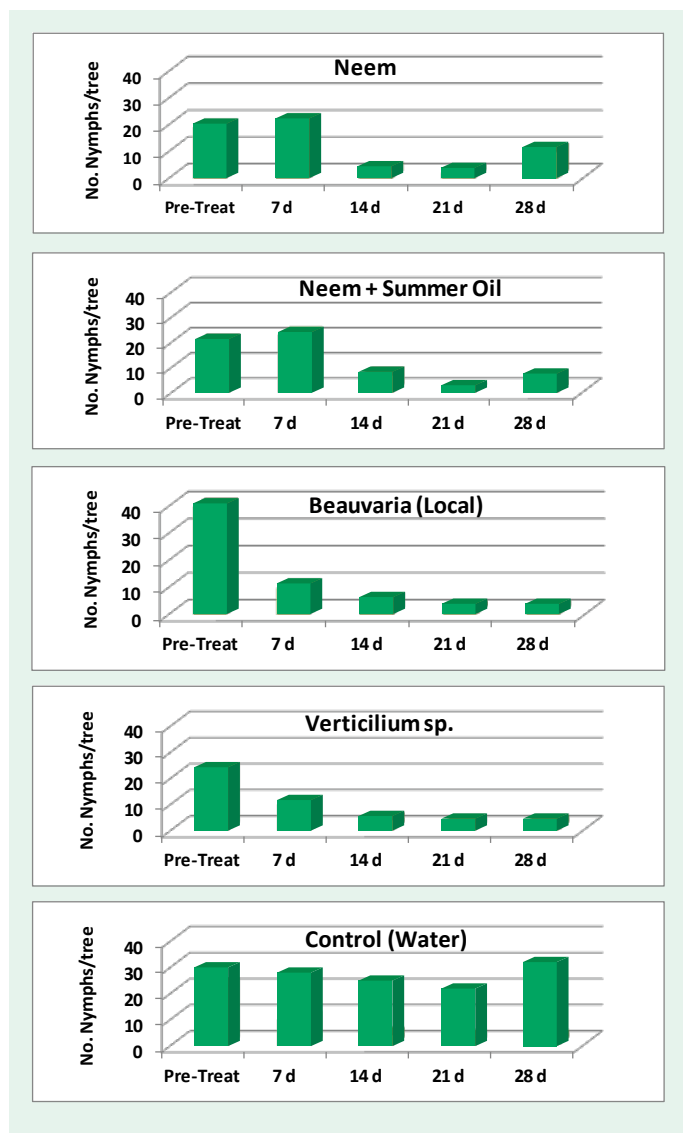


Fig.2. Efficacy of different bio pesticides (Neem, Neem + Summer oil, Local Beauvaria, Commercial Beauvaria, Verticilium sp, and the Control) on nymphs of Dubas bug after 7, 14, 21, and 28 days of treatment.

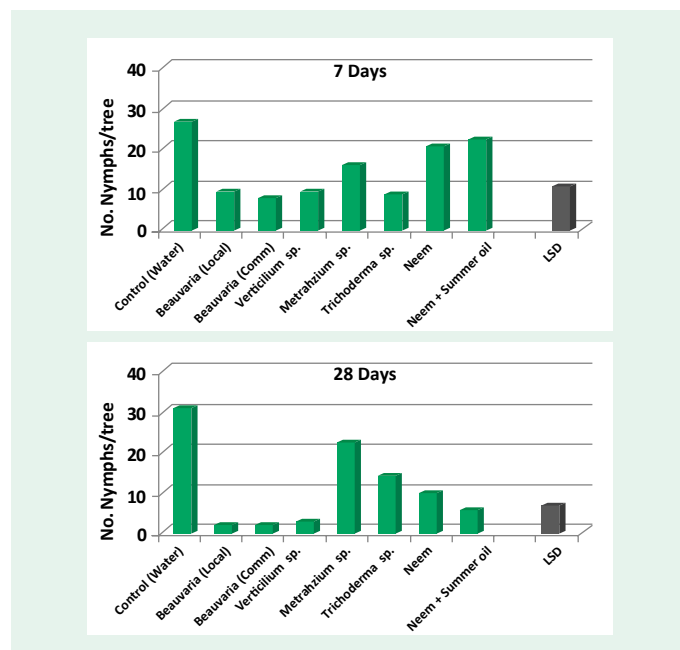


Fig.3. Yields of date palm trees for the 2010 season using the biological agent *Bacillus thuringiensis* (BT) as a spray and dust, and biological insecticide Spinosad and Deltamethrin compared to no control programs.

Conclusions:

- Neem alone, or in combination with Summer Oils, proved to be an ideal alternative to traditional chemical insecticides for the control of Dubas Bugs. Efficacy of Neem is not the only advantage, but it is safe and friendly to the environment.
- The efficacy of spraying Neem is directly related to the quality of its formulation, time of application, and spraying techniques. The ground spraying is the optimum technique to apply Neem to control Dubas because aerial spraying required further research.
- Our results have encouraged the Ministry of Agriculture to adopt botanical insecticides such as Neem and other similar products as the major control method in their annual campaign.



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