Studies on the incidence of *Maruca vitrata* Fabricius (Crambidae: Lepidoptera) on improved cowpea and non-cowpea varieties at Maradi, Niger

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**Context**

Cowpea, *Vigna unguiculata* (L.) Walp. (Leguminosae: Papilionaceae), is a highly important grain legume crop grown in the semi-arid and dry savannah regions of tropical Africa (Singh and Venam, 1979). It is an important source of energy and protein for about 200 million people in Africa and also forms a vital cattle forage crop in many farming systems (Motimine et al., 1997). Despite the importance of cowpeas, several hosts and abiotic stresses reduce its production in the field and to a value of yield. Among the biotic factors, field and storage stage insect pests are the most serious (Singh, 1983; Drewry et al., 1986; Akins, 2000). The major insect pests of cowpeas include aphids (Aphidoidea: Aphididae), *Maruca vitrata* (Lepidoptera: Crambidae), and the storage weevil, *Callosobruchus maculatus*. Of these, *M. vitrata* causes significant damage to cowpeas in sub-Saharan Africa.1

Cowpea (Vigna unguiculata) [synonym *Vigna unguiculata* (L.) Walp.] is a legume crop, also known as the cow pea. Exotic and introduced cowpea varieties from Africa have been shown to have high resistance to pests and diseases. The major insect pests of cowpeas include aphids (Aphidoidea: Aphididae), *Maruca vitrata* (Lepidoptera: Crambidae), and the storage weevil, *Callosobruchus maculatus*. Of these, *M. vitrata* causes significant damage to cowpeas in sub-Saharan Africa.

The incidence of *M. vitrata* on the pods and flowers of cowpea was also monitored during the crop growing season. Light trap studies were conducted to assess the incidence and abundance of *M. vitrata* at Maradi during the study. The trap was checked each four days and all the *M. vitrata* adults were collected and put into plastic vials containing 70% ethanol. Daily rainfall data during the crop growing seasons in 2007, 2008, and 2009 were obtained from the local meteorological station. The incidence of *M. vitrata* on the pods and flowers of cowpea was also monitored during the crop growing season. Flowers and pods from 15 plants were randomly selected to estimate the incidence of *M. vitrata* in the pods.

**Methodology**

The field experiment was conducted at the INRAN station for DGP (Dry Grains Pulse) in Maradi during 2007, 2008, and 2009 cropping seasons. The experiment started at the beginning of the rainy season for each year for the experiment. The experimental design for all the study was completely randomized block design with treatments which are the cowpea and non-cowpea plant materials replicated within blocks. Each measured 4.8 m by 4.8 m, the space between plots was 2 m while between blocks was 3 m. The plants were sown at a spacing of 0.8 m by 0.8 m within plots. Three seeds were sown per hole. In 2007, the varieties were as follows:

- IT98 KD 374-57, an improved early maturing cowpea variety developed by the International Institute of Tropical Agriculture, Nigeria; and
- TN 5-78, medium maturing cowpea variety from INRAN;
- TN 5-8A, late maturing cowpea variety also from INRAN;
- Sesanba pachycarpa, a wild legume plant and;
- Vigna vexilata, wild cowpea variety.

In 2008 and 2009, the same planting conditions were followed with slight changes in the varieties. The varieties used were:

- IT 97K 499-38, an early cowpea variety;
- TN 5-87, intermediate cowpea variety;
- Daname, late cowpea local variety; and
- S. pachypacha, a tropical legume.

Data on the incidence of *M. vitrata* on the treatments throughout the crop growth cycle was carried out 3 weeks after sowing. Light trap studies were conducted to assess the incidence and abundance of *M. vitrata* at Maradi during the study. The trap was checked each four days and all the *M. vitrata* adults were collected and put into plastic vials containing 70% ethanol. Daily rainfall data during the crop growing seasons in 2007, 2008, and 2009 were obtained from the local meteorological station. The incidence of *M. vitrata* on the pods and flowers of cowpea was also monitored during the crop growing season. Flowers and pods from 15 plants were randomly selected to estimate the incidence of *M. vitrata* in the pods.

**Discussion /conclusion**

These data allow us to provide additional information related to the population dynamics of *M. vitrata* in Sahelian region, Maradi, Niger.2

1. Adults of *M. vitrata* emerged during the rainy season during the period August to October as noted in Nigeria and Kenya in 1980 and 1994 by Bothenko et al. (1987) and Patabhugadage in Surinak Fokoza by Philips in 2007. Adults of *M. vitrata* were captured during the day and also it is reported the scarcity of the wild alternate hosts in the zone of Maradi and Zinder in Niger.1

2. Maradi and Zinder region is a Mozambique plateau with annual rainfall of 600–700 mm and temperature of 27°C, a perfect environment for cowpea growth.

3. Studies on the incidence of *M. vitrata* in Nigeria (Nieuwenhuizen and Capinera, 1979), Tanzania (Sanoun et al., 1996), and Zimbabwe (Kamara et al., 2002) also report a high incidence of *M. vitrata* which was correlated with rainfall. In the Sudanese Sahel, *M. vitrata* attack is related to rainfall. This result is consistent with reports that heavy rainfall over the previous few weeks is associated with cowpea pod infestation by *M. vitrata* (Damme and Rivera 1997; Kawazu and Uchida 1998).4

4. The peak development of *M. vitrata* is in its late larval stage. The legume is initially vacated because of its low germination rate, but it is late maturity legume. Very few larvae of *M. vitrata* were noted on some flowers observed in this study.4

5. Environmental conditions inside the legume pod were measured using a thermal imaging system. In the legume pod, both the temperature and the humidity were higher than those of the outside environment.6

6. On the other hand, *S. pachypacha* is a wild plant on which *M. vitrata* develops. Several authors have classified as alternate host of the moth (Achaa and Ojija, 1994). In Maramar zone, the species starts flowering late compared to early cowpea and this high rate of infestation flowers by *M. vitrata* is certain due to its large number of infestations.7

7. It is also possible to argue that *M. vitrata* make at least two generations per year in the region of Maradi. There is at least two or three peaks occurrence of young larvae for three years. Also, during the three years, larvae of *M. vitrata* were observed on field over a period of 44 to 45 days, enough time to performing at least two cycles of its development period from egg to adult. It takes an average of 192 days at 28°C.4

8. As in the case of adults, larval development of *M. vitrata* is also related to rainfall. In 2007 and 2008, the observed amount in the plots was much higher than what was noted in 2009 years when recorded a low rainfall.4

9. The damage due to *M. vitrata* on early varieties is much more important on late varieties. With a maximum of 2% to 3% larvae per plant, the losses ranged between 4% to 6% for flowers, between 8% to 11% for pods and between 10% to 15% for damaged hairy organs. These rates are those rates made by 3% damage of hairy organs. These rates are below those rates made by Singh et al. (1995) and Drewry et al. (1994).

10. The local variety Dan Demme was slightly infested by *M. vitrata* Moths. Indeed it seems to escape the attacks of the insect because of its late flowering characteristics. However, it cannot be proven that this variety is more resistant to infestation by *M. vitrata* larvae.

11. Flowing stage of *S. pachypacha* and larvae of *M. vitrata* on cowpea pod. *M. vitrata* trial at station Maradi.