OSTRINIA NUBILALIS (HÜBNER) STEM BORER OF RICE IN ITALY

Giudici ML & Villa B

Ente Nazionale Risi - Centro Ricerche sul Riso - Castello d'Agogna (PV) - crr.patologia@enterisi.it

Abstract
In the last 2-3 years, particularly in the 2003 summer, white heads has increased in the Italian rice-fields: plants bearing discoloured panicles with empty or partially filled grains showed a hole in the culm, disintegrated tissues and frass due to boring and feeding larvae. The plant examination and sampling let to classify the stem borer as *Ostrinia nubilalis* Hübner (Lepidoptera: Crambidae), the European corn borer. This species is polyphagous but it is the first time it is recorded on rice in Italy, whereas in the U.S.A. the first severe infestation in rice occurred in 2003. Probably in the Italian rice growing areas, *O. nubilalis* migrated, not at damaging levels, from the less attractive early maturing corn to the more succulent rice plants owing to the unusual summer high temperatures and dry weather. Preliminary observations on the symptoms and on the cycle of *O. nubilalis* on rice are here reported but the relation between this moth and rice has to be more probed. It is interesting to point out that egg masses were often found parasitised by tiny wasps of the genus *Trichogramma* (Hymenoptera: Trichogrammatidae).

Keywords
Ostrinia nubilalis; European corn borer; *Trichogramma*; white head; rice; Italy.

The presence of discoloured panicles just after flowering was sporadic without causing yield loss in Italian rice-fields in the last thirty years, whereas it is increased in the last two-three years. Therefore a survey starts in the Italian rice cultivated area in order to improve our knowledge on this phenomenon, observing and collecting a great number of plants to study symptoms, to identify the causal agent and to understand its relations with rice.
The distribution of discoloured panicles in the rice-field is random and they are less or more frequent according to the seriousness of the attack.
Affected plants bear white and dried panicles with unfilled spikelets and their panicles come out easily, if gently pulled out from the sheath of the flag leaf, showing the brownish, bored and rotting stem: this phenomenon is due to insect larvae which, feeding on culm tissues, interfere with the translocation of water and nutrients. This symptom is called "white head" and is the typical one resulting from the attack of stem borers after panicle initiation, whereas when rice is attacked during the vegetative phase, the central leaf does not unfold, turns brownish and dries off and symptom is called "dead heart" (Pathak, 1977). Stem borers are the most serious pest of rice in many rice growing areas in the world (Centre For Overseas Pest Research, 1976; Pathak, 1977; Boyd, 2004; Castro, 2004), but they have never been a problem for Italian rice-fields.
The recently observation of white heads, but not of dead hearths, with increasing frequency led us to fear that the stem borers *Chilo suppressalis* Walk., which is present in Portugal (Lima, 1997), Spain (Herruzo and Morote, 1996) and France (Goarant *et al.*, 1996) with yield losses up to 25%, or *Sesamia nonagrioides* Lef., reported on rice in Sardinia in 1959 (Boselli, 1959) and now the insect causing the most damage in Greece (Ntanos, 2001), had reached and infested Italian rice-fields.

But the only stem borer found during our survey is the European corn borer, *Ostrinia nubilalis* Hb. (Lepidoptera: Crambidae), well known and dreaded by corn growers. Although species is polyphagous (Süss, 1983; Tremblay, 1986), it is the first time it is reported on rice in Italy, whereas in the U.S.A. the first severe infestation in rice occurred in 2003 (-, 2004; Castro, 2004).

This insect was present in the districts of Pavia, Milan, Vercelli and Ferrara and it was mostly noticed where plants were more vigorous in rice-fields that had received high rates of nitrogen fertilisers. It infested both old and new variety, such as Titanio, Torio, Rubino, Baldo, Volano, Ariete, Cripto, Loto, Rodeo, etc., and, in great number, also the vegetation on field borders.

Ostrinia nubilalis was found in rice-field at all the instars of its life cycle: egg, larva, pupa or crysalid, and adult. To further confirm the classification, larvae of different instars were collected from infested plants and reared at room temperature on healthy plants, in pots, in laboratory until the adult emerged.

In this paper our preliminary observations are referred, but they have to be confirmed and integrated pursuing this research.

In the summer 2003, yellow-brown to medium-brown adults, of both the sexes, were first noticed in rice-field in mid-Jun, but a far greater number was observed at late July–early August.

Flat, translucent, white, eggs overlapped like fish scales in two-three regular and parallel rows and were laid preferably on the underside of the leaf blade of the first and second internode below the flag leaf. The day before hatching they appear to have a black centre corresponding to the head capsule of the developing larva.

The white newly hatched larvae are long about 2 mm and become creamy white to grey reaching the length of 25 mm. Very seldom more than one larva per culm was found. Each stem showed a only hole, always on the upper internodes, and when frass was extruded the larva had left the culm to look for another one: therefore it seems that the caterpillar go through the same hole both to enter and to exit.

On the contrary the adult exit hole, which usually rice stem borers cut for the moth emergence (Centre For Overseas Pest Research, 1976; Pathak, 1977), seems not exist. In fact the brown pupa has always been found in the sheath of the flag leaf, few centimetres below the panicle, which sometimes was chewed by the larva. The crysalid, with the exuvia still on its caudal end, was almost always protected by a very light silken web woven by the caterpillar before pupation. The pupa position in the flag leaf sheath and the fact that its head was put always towards the plant apex suggest that moth should exit going up and getting the same natural opening through which the panicle emerges.

In some cases the panicle spikelets were not empty but partially filled because the stem had been bored after the grain formation was started. The larval feeding on the leaf sheath inside surface made the sheath itself turn yellow-brownish, often in the areas corresponding to the hole and to the chewed parts of the culm, or of the panicle when it was gnawed before rice heading.

It is interesting to point out that egg masses were often parasitised by tiny wasps of the genus *Trichogramma* (Hymenoptera: Trichogrammatidae). Parasitised eggs are easily single out thanks to their black colour and these parasitoids are natural enemies, which are studied for biological control of the European corn borer (Maini and Burgio, 1990; 1991; Hoffmann, 1999).

In the Italian environment *Ostrinia nubilalis* usually goes through one or two generations a year and overwinters as mature larva within corn or other plant stubble (Süss, 1983); Tremblay, 1986): what occurs on rice has still to be investigated.

The recent increasing rice infestation, till now fortunately not at damaging levels, may be due to several factors, but climatic changes are certainly very important. In the last two-three years, particularly in 2003, summers were warmer than usual and probably high temperatures shortened the life cycle of the European corn borer and increased its population. Moreover in 2003 the unusual drought made corn dry early, leading moths to migrate from the less attractive maturing corn to lay eggs on younger and succulent crops, like rice, or on other normally less attractive hosts, like flowers (Colombo *et al.*, 2003) and grapevines (Cravero and Bosio, 2004). The new details and knowledge we are now acquiring on the behaviour of the European corn borer in rice-field may be also influenced by the current summer weather which is rather different from that of the last years.
The here reported preliminary observations on the symptoms and on the cycle of *O. nubilalis* on rice are only the first step and the relation between this moth and rice has to be more probed.

References

- (2004). Corn pest appears in Louisiana rice, causing damage. *Rice Farming* 38 (3): 21.

Boselli F (1959). Un nuovo importante parassita del riso: la perforatrice dei culmi, *Sesamia nonagrioides* (Lef.) Tams (Lep. Noctuidae). *Ann. della Sperim. Agraria*. Roma, Osservatorio per le malattie delle piante di Cagliari, N.S. Vol. XIII (1): XLVII-LXIX.

Boyd V (2004). An easterly migration. Rice Farming 38 (3): 14-15.

Castro BA (2004). Stalk borers. *Rice Journal* 107 (4): 10-11.

Castro BA, Riley TJ, Leonard BR, Baldwin J (2004). Borers Galore Emerging Pests in Louisiana Corn, Grain Sorghum and Rice. *Louisiana Agriculture* 47 (1): 4-6.

Centre For Overseas Pest Research (1976). Stem borers. In: *Pest control in rice*. Second edition. London, England C.O.P.R.: p119-131.

Colombo M, Jucker C, Maspero M (2003). Danni da piralide su floricole in Lombardia. *L'Informatore Agrario* LIX (44): 72-73.

Cravero S and Bosio G (2004). Bilancio fitosanitario 2003: Piemonte. *L'Informatore Agrario* LX (15): 41-42.

Giudici ML and Villa B (2003). La piralide del mais in risaia: identificato l'insetto responsabile del perforamento del culmo in Italia. *Il Risicoltore* XLVI (11): 8.

Goarant G, André F, Clément G, Betbeder-Matibet M (1996). La pyrale du riz en Camargue: "nuisibilté". *Phytoma* 479: 26-29.

Herruzo AC and Morote F (1996). Regional advantages and economies of size in Spanish rice farming. In: Rice Economics in the Mediterranean Basin, Proceedings of the Córdoba seminar, Spain, 15-16 December 1994. Ed. J. Chataigner, Montpellier, CIHEAM, *Cahiers Options Méditerranéennes* Vol. 15, n. 2: 148-152.

Hoffmann M (1999). Trichogramma ostriniae Pang et Chen Hymenoptera: Tricogrammatidae. In: *Biological Control: A Guide to Natural Enemies in North America*. http://www.nysaes.cornell.edu/ent/biocontrol/parasitoids/trichogramma_ostriniae.html

Lima A (1997). Current situation of rice production in Portugal and the main diseases that occur. In: Rice Diseases in the Mediterranean Region and Breeding for Resistance, Proceedings of the Montpellier seminar, France, 15-17 May 1995. Ed. J. Chataigner, Montpellier, CIHEAM/FAO, *Cahiers Options Méditerranéennes* Vol. 15, n. 3: 29-40.

Maini S and Burgio G (1990). I parassitoidi di *Ostrinia nubilalis* (Hb.) in Emilia Romagna. Informatore fitopatologico XL (9): 19-28.

Maini S and Burgio G (1991). I Trichogramma. Informatore fitopatologico XLI (7-8): 35-40.

Ntanos D (2001). Evolution of rice research and production in Greece. In: *International rice commission newsletter*. http://www.fao.org/DOCREP/004/y0906T/y0906t05.htm

Pathak MD (1977). Stem borers. In: *Insect pests of rice*. IRRI, Los Baños, Philippines: p2-15.

Süss L, Ciampolini M, Antonelli F (1983). Presenza nell'Italia settentrionale di piralide del mais (*Ostrinia nubilalis* Hb.) ad unico ciclo annuale. *L'Informatore Agrario* XXXIX (24): 26327-26333.

Tremblay E (1986). *Ostrinia nubilalis* (Hb.). In: *Entomologia applicata*. Volume secondo. Parte seconda. Liguori Editore, Napoli: p331-337.