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【Scientific note】

印尼東爪哇玉米上稻苗蠅(Atherigorna exigua Stein)的農業及化學防治【科學短訊】

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Abstract

摘要

稻苗蠅 (Atherigorna exigua) 為印尼玉米生長初期之重要害蟲，尤以東爪哇為烈，發芽後1-7天的玉米苗為稻苗蠅產卵所好之目標，超過10天以上者則難成為產卵目標，雨季之間為稻苗蠅產卵盛期，玉米受害比率超過90 % 。 利用50 % 大利農及50 % 撲滅松乳劑作為化學防治法，亦均能收防治大效。適宜濃度為每公升水中溶有0.5毫升之乳劑，並不需要更高之劑量，大利農之施用法為：在玉米發芽的第二天處理一次，唯一次的處理無法全面防患整個玉米可能受害期，故於第一次施藥後第三天再行處理一次；若有需要，可再經三天後再進行第三次施藥。 玉米與水稻的混植亦為可行的防治方法，水稻收穫前二週，進行玉米之撒播，藉著稻株的掩護，可使玉米苗避免稻苗蠅產卵之為害。最嚴重情況下，玉米苗受害比率亦低於20 % ，且受害苗僅限於離田1.4公尺寬之邊緣地區。

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AGRONOMIC AND CHEMICAL CONTROL OF RICE SEEDLING FLY (*ATHERIGONA EXIGUA* STEIN) ON CORN IN EAST JAWA

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ABSTRACT

The rice seedling fly (*Atherigona exigua* Stein; Muscidae) is known as an insect pest of the seedling of up-land rice, corn, wheat and some graminaceous weeds. The distribution of this fly is considerably wide, covering the triangle area of India, Indonesia, Caroline islands and Peking. In Indonesia, the fly is called "Lalat bibit" and is listed as one of the most destructive insect pest on corn. In this district, oweing to the combination of the dry and rainy seasons, almost of the cultivated area is covered with the crop pattern of corn-corn-rice or corn-rice-rice for a year round. It is obvious that corn is the major crop during the dry season.

The following is the results of work conducted at Kediri, Jawa Timur during November 1976 to September 1978 in purpose to establish an improved control measure against this insect pest. Throughout this study, corn variety "Kretek" was used as the host-plant of the flies. It is a high yielding early corn variety and has been extensively recommended to the farmers by the Indonesian government since 1975.

Before to start the work on the establishment of control measure, following data are prepared through the field and laboratory experiment.

1) The longevity of adult flies was 9.45 and 20.65 days in average for the males and females respectively. The oviposition period was about 7.5 days. During this stage she deposited about 70 eggs.
2) A corn seedling was exposed to the ovipositional attack from the first day of germination. The susceptible duration to the attack spelled about 1 week. However, the oviposition mostly concentrated on the 2 to 5 days old corn seedlings. Consequently the first, second and third leaves of corn seedling become a main target of the ovipositional attack.
3) A female fly showed an inclination to avoid injuried seedlings for oviposition. Seedling of more than 10 days old did not have the possibility to become the ovipositional attack target.
4) The egg stage was 1–2 days. Percent hatchability was generally higher in the eggs which were deposited on the 1st–3rd leaves, generally reaching higher than 90%. The rate of successful penetration and establishment of the larvae in the seedling stem was also high. Therefore, the majority of the oviposited seedlings reveal the damaged symptom within a few days.
5) There are three larval instar stages. The duration of each instar stage is estimated to

be 3–5, 4–6 and 7–8 days respectively. The larvae has strong solitary habit. The 3rd instar larvae is solely find in corn seedling. A mature larvae leaves injuried seedling and pupates in the soil.

6) The ovipositional attack become active with the beginning of the rainy season. In this season, it is ubiquitous that the percent of injuried seedling records over 90% in the farmer's corn field. The attack decreased gradually during the end of rainy season and entirely ceased in one month. The damage during the dry season was negligible.

The experiment of the control measure is designed to based on the above mentioned data.

The experiment of chemical control was at first conducted with 50% diazinone and 50% sumithion E. C. The application of both insecticides showed on excellent control effect. However, the effect of the former one was slightly superior to that of the later one. The concentration of 0.5 ml E. C. per liter of water was promising. But in order to obtain a more certain control effect, the concentration of 1.0 ml E. C. per liter water is preferable. A higher dosage of insecticide was not demanded. Although the ovipositional attack on the young corn seedlings by the adult fly starts on the first day of the germination, on that day not all the seeds had germinated yet. So it is favorable to postpone an insecticide application until the 2nd day of the germination. After the 3rd or 4th day, part of the eggs had already hatched and the larvae had penetrated into the corn stem. The application to the insecticides on these days could not prevent the appearance of injuried stem effectively. It is the officially recommended method that the first application should be carried out on the 3rd day of the germination. But according to the result of the present work, it is too late to obtain a sufficient control effect. Although the insecticide treatment on the 2 day old seedlings could obtain an adequate protective effect for the earlier stage, the ovipositional attack would continue on the older seedling. Therefore, it is necessary to have a further application for the older corn seedlings. Accordingly, the 2nd application should be made 3 days after the 1st application. In the case of epidemics or long spelled occurrence of ovipositional attack, the 3rd application is demanded on 3 days after the 2nd one. While in almost cases, two applications are enough to decrease the percentage of damaged seedling to be below 15%.

In Jawa, the average farm area is very small. Therefore, an intensive cultivation system is popular on this island. Sometimes, they plant corn with red pepper, cassava, string bean etc. And when the germinating corn is covered with those crops, the rate of damaged corn by the fly was significantly low. It is seldom above 20%. The fact seemed to suggest that the ovipositional activity of the fly will be prevented by the existence of other covering plant. So, because of this, the inter-cropping of corn with the paddy plant was examined.

The examined field was designed to transplant paddy seedling of IR 28 into a plant space of 20 x 20cm. Every 5th row was left blank as to grow corn later. The corn was sown 2 weeks before the paddy harvest with the space of 100 x 20cm, then it is presumed that excluding 4 days of the seed stage, the newly germinated corn seedlings would be

covered by mature paddy plants for 10 days. The cultivation and management of the paddy followed conventional method. To avoid any insecticidal effect on the Atherigona fly, no chemical treatments were done throughout the growing period of the paddy. The tests took place during the rainy seasons of 1977 and 1978. Fortunately no serious insect pests occurred during these seasons in the tested field.

The estimation of the preventive effect was carried out on seedlings sampled at various distances along rows that ran parallel with the paddy plant row. The samples were covered on the 5th and 11th days after the corn germination. The results obtained for 1977 and 1978 are very similar. It is apparent that the 5 days old corn seedlings which were not covered well with the paddy plant showed a very high rate of damage. It is recorded 75% in average. While in the location entered 20cm from a footpath, the rate of damaged seedling was reduced to an average of 13%. At the interior area of the paddy field, the rate decreased significantly and in the location 100cm from a footpath, no more oviposited seedling was observed.

The result of investigation 1 day after the paddy harvest is corresponds to about 9–10 days after the germination of corn. In this case, the rate of damaged seedling is slightly larger as compared with the estimated of the 5th day. The protective effect by the mature paddy plant is still apparent. The maximum distance of oviposited corn seedlings from footpath was 140cm. It is evitable that the inter-cropping system with paddy will restrict a range of activity of the fly to the border areas within 1.5m width or less. From the above result, it is also evident that through this inter-cropping system, even in the case of the fly population is highly epidemic, an insecticidal application can be limited to 1m width belt zone from a footpath. And such an operation is easily conducted by a worker just stand on the footpath and need not enter the paddy field where the mature paddy already grow.

Due to the blank of every 5th paddy row, about 20% decrement of paddy production was theoretically anticipated. While growth of the paddy planted on both side of blank row were specially prosperous, and almost covered the loss by the blank row. At the check paddy field, where every 5th row was also planted with paddy, the average unhulled rice yield was 5.3 tons per hectare, and that of the inter-cropping field was recorded at 5.1 tons. But on the other hand, the corn production was somewhat badly influenced. In the corn monoculture field, where the plant space were the same as that of the inter-cropping field, and twice diazinone treatment were carried out on the 2nd and the 5th day after germination, the average corn grain yield was 4.5 tons per hectare. While that of the inter-cropping field was only 3.8 tons. At this point, 2 causes of production decrement were assumed. One was that for the first 10 days of growth, the corn seedlings were densely covered by mature paddy plants, and stunt the growth of young corn seedling. Although a complete recovery from the stuntness was never attained. In the present work, a precocious variety "Kretek", whose growing duration is 80–90 days, was tested. This made the mal-influence more serious. If instead of a precocious varieties, the late variety such as Metro, Harapan Bogor whose growing duration are more than 110 days, were planted in the intercropping system, the retardiness of growth would be diminished. The second probable cause is due to the carelessness and the unhabit culture system.

During the paddy harvest, the working farmers trample and injuried part of corn seedlings. But this is not an invincible problem. It can be improved through the education and extension of the new crop system.

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利用50%大利農及50%撲滅松乳劑作爲化學防治法，亦均能收防治大效。適宜濃度爲每公升水中溶有0.5毫升之乳劑，並不需要更高之劑量，大利農之施用法爲：在玉米發芽的第二天處理一次，唯一次的處理無法全面防患整個玉米可能受害期，故於第一次施藥後第三天再行處理一次；若有需要，可再經三天後再進行第三次施藥。

玉米與水稻的混植亦爲可行的防治方法，水稻收穫前二週，進行玉米之撒播，藉著稻株的掩護，可使玉米苗避免稻苗蠅產卵之爲害。最嚴重情況下，玉米苗受害比率亦低於20%，且受害苗僅限於離田 1.4 公尺寬之邊緣地區。

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