

Information Sheet:

Garlic leaf curling: An unsolved plant health problem, 2007

Garlic is one of the bulb crops grown and used as spice or a condiment in Bangladesh. The flavor of the cloves is more powerful than that of the other bulb crops. It's pungency stronger than onion. It has a higher nutritive value than other bulb crops and it is used as medicinal crops as well. Garlic is used in most of the curries in Bangladesh. Presently Garlic is grown in about 60,000 hectares of land and which produces more than 4,00,000 MT (2007) in the country. Natore is an important garlic-growing district in country. Recently zero tillage garlic cultivation method has been introduced in chalan beel area from Moshinda village in Gurudaspur upazila of Natore district. There was about 15000 hectare land under zero tillage garlic cultivation in chalan beel areas covering five districts (Natore, Pabna, Sirajganj, Rajshahi and Noagoan) during 2006-7 cropping season and zero tillage garlic cultivation is found more profitable than most of the winter crops including boro rice.

Garlic has several plant health problems relating to diseases and insect pests. In 2005-2006 garlic cropping season there was an outbreak of garlic leaf curling health problem in chalan beel area. It was a big concern among the extensionists, scientists and farmers in 2005-2006 cropping



[Above] Prof. Phil Jones, Virologist, PPI Division, Rothamsted Research, UK and Paula Nash, CABI, UK with garlic farmers during their visit in Chalanbeel of Gurudaspur, Natore

season. Farmers applied several types of fungicides and insecticides as per advice provided by the extensionists, specialists, experts, dealers and scientists. Finally it was concluded that plant health problem was Garlic leaf curling virus disease. Thus, the plant health problem was known as Garlic virus disease, especially in Rajshahi region. It was also big concern among the plant doctors and plant health specialists (PHSs) of plant clinic network of Natore district. In the meantime Paula Nash, Coordinator, GPC, CABI, UK send a email about her visit in Bangladesh along with a

plant virologists prof. Phil Jones during 2nd-4th week of March 2006. Accordingly, we prepared a visit schedule for prof. Phil Jones, plant virologist and Paula Nash in the highly infected garlic leaf curling area in Roynavorat, Baraigram, Natore district. After receiving Prof. Phil Jones at ZIA, Dhaka, we (my self, Paula Nash and Prof. Phil Jones) were stopped at Raynavarot on the way to RDA, Bogra. We spent more than an hour with large number of garlic farmers. After long conversation with farmers and physical investigation, Prof. Phil Jones was concluded in such a way that the plant health problem may be virus, but he was not sure. Any way Paula Nash collected samples from the highly affected field (100% plants were infected) for further investigation in pathology laboratories in UK. A finding of the ELISA test was negative for potyvirus. Similarly sap inoculation and EM found negative finding. But huge populations of Thrips observed in between leaves of garlic. Paula Nash collected another virus suspected Garlic sample (leaves and bulbs) from Ahmedpur collage-2 during plant health camp for further investigation. The finding of the ELISA test was positive for Potyvirus of the garlic sample from Ahmedpur collage-2. Then, it was confusion among the plant doctors and PHSs about the Garlic leaf curling plant health problem in 2006.

Following season in 2006-7, AAS was under taken specially initiative to find-out the real cause of Garlic leaf curling from starting of cloves planting. However, during 2006-2007 garlic cropping season, there was very little Garlic leaf curling plant health problem in chalan beel areas. Even then, AAS sent the samples of infested leaf curled garlic plants to plant pathology laboratories at Bangladesh Agricultural University, Mymensingh and Bangladesh Agricultural Research Institute,

Gazipur. The findings of the diagnosis were not useful from both the reputed Laboratories. It was not possible for Dr. T.K. Dey, plant pathologist, BARI to diagnosis the problem without virological test in 2005-6 cropping season.



[Above] Leaf Curling of Garlic (Base)

Mr. Zulfiquar Haider Prodhan, Entomologist made a field visit in Garlic growing area in Gurudaspur and Baraigram upazilas during March 2007 along with AAS plant health specialists on his personal interest. During his daylong visit he examined the infested Garlic plants and discussed with large number of farmers in garlic fields at Mokimpur and Tirail village. Finally Mr. Z.H. Prodhan demonstrated and concluded the Garlic plant health problem is due to infestation of mites (red and white). He recommended for spraying the available most effective miteticides along with several cultural practices.

On the other hand, AAS was undertaken a novel initiative to unearth the farmers perception about the cause of Garlic leaf curling plant health problem and how they manage the Garlic leaf curling plant health problem. In this regards, AAS conducted participatory qualitative survey (PQS) with highly skilled garlic growers at four villages in Baraigram upazila (Agran and Tirail villages) and Gurudaspur upazila (Mokimpur and Moshinda villages) of Natore district. Most of the land of the selected four villages was under Garlic cultivation. A semi-structure questionnaire was developed under the leadership of Md. Harun-Ar-Rashid, Executive Director, AAS and Project Coordinator of PCN of GPC for conducting the PQS. Mr. S.S. Hossain, Plant Doctor (PD) and Mr. Nurun Nabi, AC, AAS were conducted PQS using with semi-structure questionnaire during 15 March-15 April 2007 in Gurudaspur and Baraigram upazilas of Natore district under the overall supervision of Mr. Harun-Ar-Rashid, AAS. The project staff in collaboration of AAS PNGOs and Agri-inputs supply dealers was selected five innovative and highly experienced Garlic growers in each of four selected villages in Natore district using pre-decided farmers' selection criteria for conducting PQS on Garlic leaf curling health problem. Accordingly, PQS on the Garlic leaf curling health problem was conducted with five selected Garlic farmers at each selected survey village. The plant doctor compiled and summarized the collected data/information of PQS and presented in Table 1.



[Above] Leaf Curling of Garlic (Top)

The innovative Garlic growing farmers' knowledge and perception on Garlic leaf curling health problem were found more solid than the scientists and extensionists. They were also conducting some sort of applied research on Garlic leaf curling management in their fields. It was noticed that they were much confident on their own findings and practices on Garlic leaf curling health problem management. It was also noticed that some farmers usually reluctant to share their findings and management practices with neighbors. It was found that the competition among the innovative farmers about to develop new and useful innovative practices on various crop management practices including Garlic leaf curling health problem management practices.

For further information:

Md. Harun-Ar-Rashid, Executive Director, Agricultural Advisory Society (AAS), House # 8/7 (Ground Floor), Block-B, Lalmatia, Dhaka-1207, Phone: 880-2-8113645, Fax: 8117781, E-mail: harunaas@gmail.com

Table.1: Summary of farmers' perception, knowledge and practices on Garlic leaf curling plant health problem and its management practices

| Subject | Farmers' perception, knowledge and practices |
|---|--|
| 1. Local name of the problem | ✓ Leaf folding or Leaf Curling or virus disease |
| 2. Symptom of the problem | ✓ The symptom can be found at seedling (young) stage and infected leaves are curled |
| | ✓ At the early stage of the infection, garlic leaf turns into yellow color and then gradually turns into brown color |
| | ✓ Each leaf becomes taller than the normal length |
| | ✓ Sometimes the leaves color turns into pale white |
| | ✓ Garlic bulb size reduced of the infected garlic plant |
| | ✓ Cloves of the infected garlic plant burst from the garlic bulb and sometimes they germinate on the bulb in the field |
| 3. Reason of the garlic leaf curling | Reasons: |
| | ✓ Excess urea application |
| | ✓ Garlic cloves planting on excess moisture content of the soil (moist/wet/soft soil) |
| | ✓ Application of too much irrigation water in garlic field |
| | ✓ Application of irrigation on moist & soft soil of the garlic field |
| | ✓ Foggy weather with heavy dewfall |
| | ✓ Late planting of garlic cloves |
| | ✓ Continuous (3-4 years) cultivation of garlic on the same field |
| | ✓ Nutrient deficiency in the soil |
| | ✓ Garlic leaf curling occurs more on highland than the low land |
| | ✓ Due to virus infection |
| 4. Percent crop damage | ✓ Garlic crop damaged between 30 - 70% due to garlic leaf curling plant health problem |
| 5. Farmer's management practices | Management practices: |
| | ✓ Urea should be applied immediately after emergence or crop establishment as top-dress. After crop establishment and during crop growing stages, urea application must be avoided |
| | ✓ Only mixed fertilizer and DAP should be applied in Garlic crop field |
| | ✓ Urea should be applied during final ploughing followed by laddering and no urea is to be applied during growth and development stages |
| | ✓ Urea application must be avoided on moist soil of the garlic field |
| | ✓ Suitable crops should be cultivated after 3 years of Garlic cultivation on the same field (Crop rotation need to be followed) |
| | ✓ Garlic planting should be administered at early and optimum time of planting |
| | ✓ Only TSP and MP should be apply in cultivation of garlic |
| ✓ Application of Thiovit in garlic crop | |
| 6. At first when it was notice? | ✓ Between 2000-2003 garlic leaf curling was first noticed among the garlic farmers |
| 7. Reason of high infestation of garlic leaf curling in 2005-2006 | Reason(s) of high infestation in 2005-6: |
| | ✓ Garlic leaf curling infection was very high in 2005-6 due to foggy weather with heavy dewfall and late planting |