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DEPARTMENT OF THE ARMY
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RICE BLAST EPIDEMIC OF 1960 (IN FRANCE)

Extrait du Bulletin d'Information
des Riziculteurs de France (Reprint
from the Information Bulletin of the
Ricegrowers of France), No. 75,
1960, pages 1-3.

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In 1960, the climatic conditions were entirely different from those that prevailed in 1959. (1). Rice infection by Piricularia oryzae Cav., a mold that is extremely sensitive to climatic conditions, likewise, presented an entirely different picture. Once again, I was able to make many observations on the response of rice varieties to the disease (piriculariosis or rice blast). These observations indicated that varieties that were weakly susceptible in 1959 were greatly susceptible in 1960. On the contrary, varieties severely diseased in 1959 were less infected in 1960. I was also able to confirm my opinion about the role of fertilizer, especially about the events produced by nitrogen fertilizer.

Meteorological Conditions

In Table 1 there are shown typical data for the period during which attacks by Piricularia occurred.

The table shows air temperature (maximum and minimum), hygrometry, rainfalls, especially those listed for the area of St. Simon and collected with the aid of the Faculty of Agriculture at Arles, under the direction of the Agricultural Service of Bouches-du-Rhone (Rhône Delta)

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- (1) See Bull. Inf. Riziculteurs, 1959, No. 63, pp 10-14.
 - (2) We thank Mr. Clave, chief engineer, director of Agricultural Services, Bouches-du-Rhone; also, Mr. Bompard, engineer, Agricultural Services, Arles, who provided me with information obtained by them and who installed a self-registering hygrometer on my request.

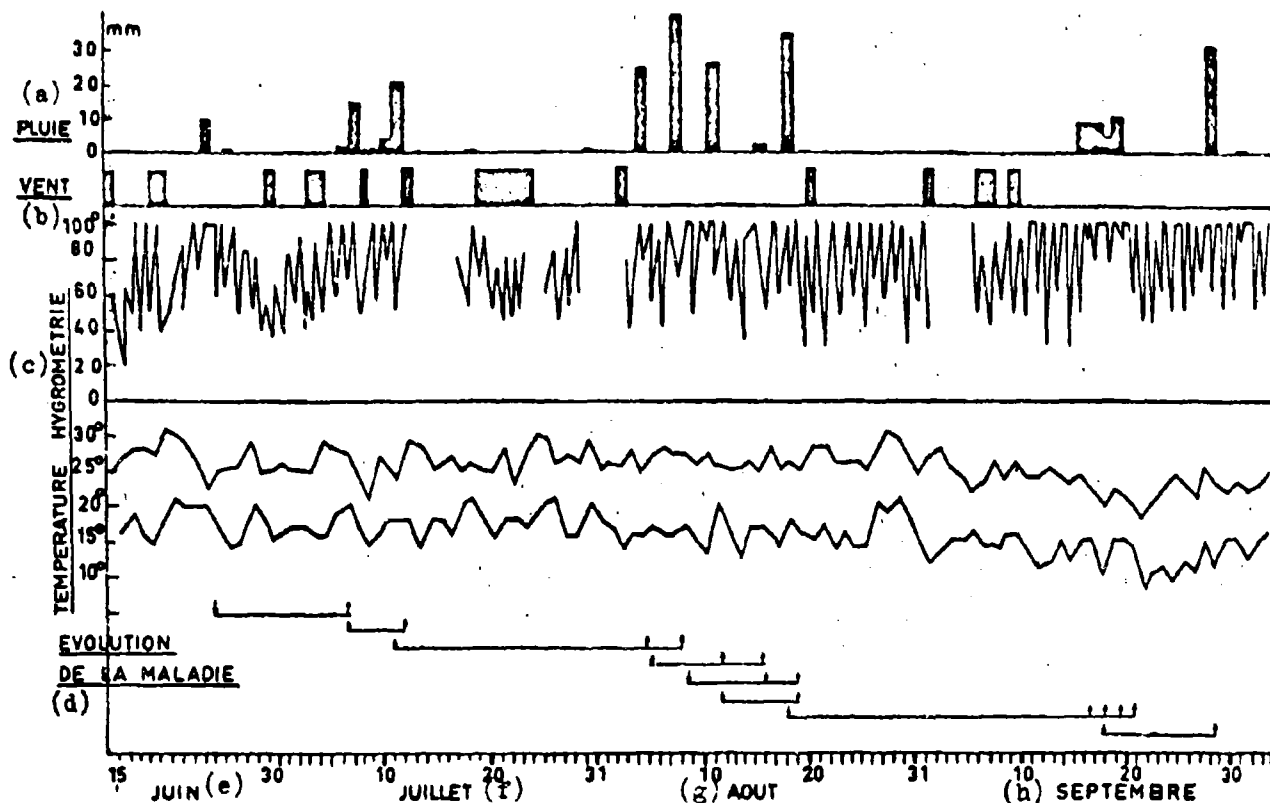


Table 1. This drawing shows the development of factors which played a role in the spread of piriculariosis during 1960. The curve of the self-registering hygrometer shows gaps caused by a malfunction of the apparatus.

Key: (a) rainfall (e) June
 (b) wind (f) July
 (c) hygrometry (g) August
 (d) Development of Rice-blast (h) September

An examination of the table for rainfalls reveals the first rain falling in the period that interests us fell towards the end of June and was followed by rain in the second ten-day period of July, followed by heavy rains in August and September. These rainy periods caused a series of attacks of rice blast disease.

Temperature was high during June, even higher than the average temperature for that month, which favored the growth of early rice varieties. On

the contrary, during July, August and September, temperatures were below the average and impeded the flowering and maturation of late rice varieties.

Hygrometry

Recordings by the self-registering hygrometer indicated those periods during which the humidity remained near the level necessary for the growth of the mold (and for its sporulation, dissemination and infection). These periods do not show up clearly in the table, because of the reduction in scale produced by printing.

One may also note the apparatus which recorded the relative humidity of the air at a higher level than that of the microclimate created at the level of the plants, was valuable whenever tillers established considerable clumps of plants.

Wind

The occurrence of winds is very important because they regulate the relative humidity of the atmosphere over the Camargue (1).

Mistral or Northwind: dry and cold, it arrests completely the growth of the mold. The number of days on which this wind blew was small. As a rule, it does not blow after a rainy period. It may be said, in a general way, this wind neither contaminates nor produces any consecutive development of spots on the plants. It merely impedes the fast spread of an epidemic by preventing sporulation.

Seawind or Southwind: humid and warm, it favors the growth of the mold by maintaining a high relative humidity.

Successive Attacks of Rice Blast

Just as we did in 1959, we observed once again that Piricularia requires a very high relative humidity in order to grow. The climatic conditions of 1960 allowed the development of a series of distinctive attacks, because there were distinctive periods which favored the growth of the mold. Let us examine these different periods which led to successive attacks of rice blast:

June 24 - rainfall of 9 mm launched the first attack which became visible in the form of typical lesions early in July.

July 7 - rainfall of 2 mm produced a humid environment favorable for sporulation of the mold.

(1) Transl. note: this is an area of the Rhone delta.

July 9 and 10 - dry northwinds prevented new infections.

July 11 - rainfall of 3 mm favored a new crop of spores.

July 12 - rainfall of 20 mm produced fresh sporulation and infections.

July 13 - August 3 - dry northwinds; internal development of the infection without sporulation. Symptoms appeared as a consequence of the infection during the last rainy period. It was in this period that I observed the devastation among the early rice varieties.

August 4-18 - humid period with strong rainfalls which favored sporulation of the mold on recent necrotic spots and spread the infection to new parts of the plant.

August 19 - September 14 - no rain and low humidity.

September 14-18 - rainy period with a rainfall of 31 mm during a four-day period. This maintained a constant, high, relative humidity with lower than average temperature which reduced the rate of infection, except in sheltered enclosures. The late rice varieties which were growing in that period became infected.

September 27 - rainfall of 31 mm produced sporulation and infection. This was an interesting aspect because of the continuation of the disease, attacks on sheaths and glumes, which serve to transmit rice blast to next year's crop of rice.

Behavior of Rice Varieties

We report only those observations on varieties most widely cultivated in the Camargue.

R.B. - early variety, grown for many years. During July it suffered the first attacks because its growth was advanced, because of its earliness and because the month of June was warm. Necrotic lesions, which I described in 1959, were again present on this variety. All parts of the rice plant were attacked: pulvinus, leaves, sheath, stubble, neck of the plant, panicle and glumes.

Cesariot - early variety, increased during 1960 in order to be distributed for production in 1961. This variety behaves like variety R.B. It is susceptible during the salmon-run season (montaison) and all parts of the plant remain susceptible. Spots on the leaves are elongated. Brown necrotic spots along nerves turn white. The neck of the panicle is frequently attacked.

Balilla - late variety, well known, poorly flowering because of the climatic conditions during September, was accompanied by a bad application of fertilizer. This variety was weakly attacked. In fact, during the early

attacks in June and July, this variety, in comparison with R.B. and Cesariot, was not yet sufficiently grown to offer an important surface to the spores of Piricularia. Growth continued and benefitted from a period which was less favorable for the mold. During September, the late attacks were not as virulent as those in sheltered enclosures. Elsewhere, the very low temperature was a limiting factor for the infection and for the spread of the disease. However, we observed attacks on the neck and rachis.

Again, variety Balilla was less susceptible than R.B. Our conclusions in 1959 were the inverse from what they are now, but it must be remembered that the abnormal climatic conditions of 1960 favored early attacks by the mold.

Role of Fertilizers

The warm and dry climatic conditions of June favored the rice plants and convinced rice-growers to increase the rate of nitrogen fertilization in the hope of a normal summer. Unfortunately, the meteorological events during the following months did not permit a normal use of these fertilizers and the plants were attacked by rice blast: growth slackened and tissues accumulated nitrogen.

In general, rice fields in which the rate of nitrogen fertilizer did not exceed 120 units per hectare suffered neither from rice blast (the same was true for early attacks on early varieties) nor from a run of the disease on Balilla.

From studying the rice journals (1), it became apparent that excessive application of nitrogen fertilizer favored rice blast disease and, in addition, another disease which attacked the base of the stem causing plants to lodge. The causative mold was Sclerotium oryzae. It is recommended to limit the rate of nitrogen fertilizer to a reasonable and economically sound quantity.

In conclusion we renew our advice offered already in the Rice Journals:

1. destroy harvest residues by burning or submersing.
2. apply a reasonable amount of nitrogen fertilizer (an average of 100 units of nitrogen per hectare) and apply it evenly.
3. use early varieties (in a normal year they ought to escape the attacks by Piricularia).
4. disinfect seeds.
5. destroy primary foci of infection.

(1) Rice Journals, Arles, Sep. 30-Oct. 1, 1960. Office of Agricultural Services, Marseille, pp 172-175; reprinted in the Bull. Inf. Riziculteurs, No. 74, 1961.