

How to protect our agriculture from high temperatures



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Bangladesh's agriculture has always been nature-dependent. Due to global climate change, the country's agriculture is advancing while facing multiple shocks and stresses, including excessive rainfall, drought, floods, salinity, submergence and cold spells. In recent years, a new challenge has emerged—extreme heatwaves or "heat shock," which represents a relatively new type of stress for agriculture.

Prolonged dry heatwaves are the primary cause of heat shock. Many may recall that on April 4, 2021, severe heatwaves (locally known as "loo" winds) in the haor regions caused extensive damage to Boro rice production due to prolonged dry conditions—an example of heat shock. During that time, in addition to the haor areas of Netrokona and Kishoreganj, 30 districts including Gopalganj, Narail, Kushtia, Rajshahi, and Mymensingh suffered losses in Boro rice, maize, vegetables, groundnuts, sunflower, and banana. The total financial loss was estimated at BDT 334 crore, of which Boro rice alone accounted for BDT 328 crore. According to the Department of Agricultural Extension, about 48,000 hectares of Boro rice fields were affected.

Fortunately, last year during the Boro season, temperatures and humidity remained within tolerable limits during

the flowering stage, so spikelet sterility (chita) was not severe. However, the intense heatwave in the first week of April this year has again raised concerns among agro-environmental experts about a potential recurrence of heat shock.

Impact of High Temperature at Different Growth Stages of Rice: Currently, Boro rice is in the field. High temperatures affect rice differently at different growth stages. In some fields, rice is at the flowering stage, while in others it is at the milking stage. Although pest and disease incidence is relatively low, rising temperatures pose a significant risk.

Vegetative Stage: Temperatures above 35-37°C cause whitening of leaf tips, chlorotic bands or blotches on leaves, and reduced tiller number and plant height. However, yield impact at this stage is relatively limited.

Reproductive Stage: This is the most sensitive stage. If temperatures reach 35-38°C within 9 days before panicle emergence, and exceed 35°C for 1-2 hours during flowering and pollination, it can cause white panicles, reduced spikelet numbers, and spikelet sterility (chita), leading to significant yield loss.

Maturity Stage: Temperatures above 35°C hinder grain filling, increasing the proportion of partially filled grains and reducing both yield and grain quality. During flowering and pollination, rice panicles are highly active. To protect themselves from hot winds, plants release large amounts of water through transpiration, which acts like a natural cooling system. Research by BRRI shows that the temperature of rice panicles and flag leaves must be maintained 4-6°C lower than ambient air temperature, requiring substantial water loss through transpiration.

However, under prolonged heat and drought, rapid water loss can cause panicles and flag leaves to dry out quickly. Completely dried white panicles are fully damaged, but since all panicles do not emerge or flower simultaneously, total crop loss is unlikely. Moreover, if grain filling has already begun, stored carbohydrates in the stem and sheath can sustain grain development, limiting losses.

Although last year's favorable temperature and humidity reduced spikelet sterility, the current Boro season is marked by low rainfall and rising temperatures, along with declining humidity. Under such conditions, the risk of heat shock cannot be ruled out.

Measures to Protect Rice from "Heat Shock" or High Temperature: The most effective way to protect rice from damage caused by severe heatwaves (heat shock) is to adjust sowing and transplanting times based on the crop's growth duration so that the flowering stage does not coincide with extreme heat.

For Boro rice varieties that are currently at the flowering stage, about to flower, or expected to flower soon, it is essential to maintain adequate water in the field. A standing water depth of 2-3 inches must be ensured until the grains in the panicle become hard.

Due to storms, bacterial diseases such as bacterial leaf blight (BLB) and bacterial leaf streak (BLS) may occur. In affected fields where rice is at the flowering stage, apply a mixture of 60gm MCO, 60gm thiovit, and 20gm zinc in 10 liters of water per 5 decimal lands, preferably in the late afternoon. Additionally, if the crop is at the panicle initiation (booting) stage, applying an extra 5 kg of potash per bigha as a top dressing can yield better results.

At this stage, neck blast (panicle blast) can severely affect Boro rice. Once panicle blast occurs, it cannot be effectively controlled. Therefore, preventive measures are critical. Regardless of visible symptoms, fungicide should be applied twice—once immediately after panicle emergence and again after 5-7 days. Use either 54gm of Trupper 75WP/ Difa 75WP/Zi75WP, or 33gm of Nativo 75WG per bigha (33 decimals), or any approved fungicide from the tricyclazole/strobil group, mixed thoroughly in 67 liters of water, and spray in the late afternoons.

During this period, brown planthopper (BPH) infestation may also occur. In vulnerable areas, apply approved insecticides such as Mipain 75WP/ Plenum 50WG, Ekaterra 25WD, Admire 20SL, Sannectin 1.8EC, Acephate 75SP, or Platinum 20 SP at the recommended dosage mentioned on the label. Insecticides must be applied at the base of the plants, and using a double-nozzle sprayer is recommended for better effectiveness.

Progress in Developing Heat-Tolerant Rice Varieties: Recognizing the adverse impacts of climate change, the Bangladesh Rice Research Institute (BRRI) initiated research in 2013 to develop heat-tolerant rice varieties. By crossing the heat-tolerant N22 variety with the widely cultivated BRRI dhan28 using marker-assisted backcrossing, a promising line with moderate heat tolerance has been developed. It is currently undergoing regional yield trials. If approved, this variety is expected to perform well even when temperatures exceed 35°C during flowering. Source: Plant Pathology Division, Entomology Division, and Plant Physiology Division, BRRI, Gazipur-1701.

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