IMPACT OF BIOREGULATOR ON CORN RESILIENCE TO NON-OPTIMAL TEMPERATURES

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Background: A plant's ability to maintain productivity under extreme temperatures and drought depends on its genotype and stress response. Therefore, current research focuses on identifying corn lines and hybrids with high germination energy and vigor in cold soils, as well as stable growth under drought and temperature fluctuations. Their performance can be improved through an integrated approach combining genetic potential with pre-sowing seed treatment using natural growth regulators.

The aim of this study was to evaluate the effect of the bioregulator JS, extracted from *Juniperus sabina* L. plant, on the early stages of seed development of the mid-season corn hybrid Porumbeni 396 MRf (FAO 390) under temperature stress.

Materials and methods: The corn hybrid Porumbeni 396 MRf (FAO 390) has a horny endosperm, ensuring specific adaptability. Its high grain density slows moisture absorption, causing low germination energy in cold soil ("difficult start"). At the same time, it shows higher heat tolerance at early growth stages than hybrids with flint and dent endosperm.

Seeds were exposed to non-optimal temperatures in two tests: a cold test, with germination for 7 days at +10°C followed by 4 days under optimal conditions; and a heat test, with seeds kept in a water bath at +50°C for 30 min, then germinated for 7 days under optimal conditions, according to international rules.

Results: At low temperature (+10°C), pre-treatment of seeds with the bioregulator JS stimulated metabolism and showed a strong protective effect. Root and seedling vigor increased by 17.5% compared with the untreated control. Energy metabolism was also optimized: the share of biomass mobilized for root and seedling growth rose from 49.58% (control) to 53.98% (treated), while respiration costs decreased by 8.7%. As a result, metabolic efficiency increased by 19.3%, indicating that endosperm resources were used mainly for morphogenesis rather than compensation of temperature stress.

Under heat stress (+50°C), the effect of JS shifted from growth stimulation to protection and adaptation. Despite maintaining high root and seedling vigor, 28.4% above the control, a marked restructuring of bioenergetics was observed: metabolic efficiency decreased by 31.5%, while respiration increased by 18.4%. This suggests activation of energy-demanding repair mechanisms and heat shock protein synthesis. Resources were redirected from biomass accumulation to viability maintenance and protection against overheating. Thus, JS was most effective at low temperature, where it optimized endosperm resource use. Under heat stress, it stimulated defense systems, temporarily reducing metabolic efficiency in favor of survival.

Conclusions: Pre-treatment of the Porumbeni 396 MRf corn hybrid seeds with the JS bioregulator demonstrates high effectiveness in mitigating temperature stress, although the adaptation mechanisms are fundamentally different, depending on the influence of sub-optimal and super-optimal temperatures.

Keywords: bioregulator JS, corn seed, vigor, metabolic efficiency, non-optimal temperature

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