

## EFFECTS OF *BACILLUS CEREUS* ON COTTON GROWTH AND YIELD

J.A. Hickey

Microflo Company

Memphis, TN

D.M. Oosterhuis

Department of Crop, Soil, and Environmental Sciences

University of Arkansas

Fayetteville, AR

### Abstract

An important objective of plant growth regulators (PGRs) is to balance vegetative and reproductive growth as well as improve yields and fiber quality. Various PGRs have been used to achieve these objectives with varying successes. Recently, *Bacillus cereus* (BC) was added to mepiquat chloride (MC) for additional yield advantage. The current research effort has focused on using BC with hormone based growth enhancer products for added growth and yield improvement. The hypothesis was that use of a combination of *Bacillus cereus* and mepiquat chloride will lead to increased efficacy of other hormone based products and improved plant growth and higher yields. The objectives of these studies were to evaluate the benefits of applying *Bacillus cereus* with Mepiquat chloride and a hormone based PGR on cotton yield and fiber quality, and also to determine the optimum rate and timing of BC plus a PGR.

Pix Plus, formerly MepPlus, is a new PGR first tested in 1994 and registered in 1997 by Microflo (Memphis TN) and now marketed by BASF (Research Triangle Park, NC). It consists of MC (4.2%), the bacteria *Bacillus cereus* (0.05%) and inert ingredients (95.75%). The *Bacillus cereus* was reported to have tolerance exemption on all crops. Recent studies (e.g. Oosterhuis et al., 1998, Parvin and Atkins, 1997) have indicated that Pix Plus had a similar effect on plant height control as MC. In addition, Pix Plus has been reported to increased photosynthesis, leaf starch content, dry matter partitioning (Zhao and Oosterhuis, 2000), and lint yield (Parvin and Atkins, 1997) of field-grown cotton compared with the untreated control and MC treated plants.

Subsequent research showed that a combination of BC plus a hormone-based formulation enhanced growth characteristics that influenced final yield. Growth chamber and field evaluations initiated in 1998 evaluated several formulations in either single or split applications. Favorable results were obtained and additional field trials were started in 1999 to refine optimum rates and timing. Based on data generated, extensive field trials under the direction of certified crop consultants and university researchers began in 2000. In 1998, the formulation was studied at 17 locations as well as in the growthroom. In 1999 the formulation was again studied with additional timing studies at 20 locations. In 2000, a single timing was evaluated at 33 locations. In 2001, the formulation was optimized in growthroom studies. In all field studies, cotton (*Gossypium hirsutum* L.) was planted using current state extension recommendations for optimum cotton yield. Generally, treatments consisted of (1) an untreated control, (2) Pix Plus as needed for height control, and (3) PGR-IV Plus (i.e., with *Bacillus cereus*). Spray applications were made using aerial application or backpack sprayer calibrated to deliver 93.5 L/ha in University small plot studies and consultant field trials. The new product, PGR-IV Plus, was tested over a four year period in growthroom studies and at 71 locations across the Cotton Belt on cotton that had received Pix Plus, resulting in an overall average 67.3 lb lint/acre increase in yield. Future studies will continue to evaluate *Bacillus cereus* in PGR-IV Plus for growth and yield advantages as well as in combinations with insecticides.