Insect Resistance Management Grower Survey for Bt Field Corn

2002 Growing Season

Agricultural Biotechnology Stewardship
Technical Committee

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A. Introduction

The Bt corn industry has been operating under the "unified plan" for Insect Resistance Management (IRM) since it was accepted by the US Environmental Protection Agency (EPA or the Agency) in 2000. The unified plan was developed by the Agricultural Biotechnology Stewardship Technical Committee (ABSTC) in cooperation with the National Corn Growers Association (NCGA), and mandates a 20% non-Bt corn refuge in the Corn Belt and a 50% non-Bt corn refuge in areas of overlapping corn and cotton production. The objective of the unified plan is to provide consistent IRM recommendations in the context of a practical, science-based approach, thereby enhancing the probability of proper implementation and compliance. Minor modifications to the refuge distance requirement and "strip refuge" configuration were issued under the amended Bt corn registrations of October 15, 2001, but the primary components of the unified plan have remained unchanged for the past three corn-growing seasons.

The IRM Stewardship Subcommittee (Subcommittee) of the ABSTC, consistent with the unified plan and EPA requirements, commissioned a post-harvest survey of Bt corn growers in the autumn of 2000 to determine the baseline level of grower awareness and adoption of the newly established IRM requirements. The survey was designed and conducted by the independent marketing research firm, Marketing Horizons, Inc., of St. Louis, MO, after the ABSTC provided information on seed markets, Bt corn penetration, grower behavior, and IRM requirements. The survey was repeated in 2001 after the questionnaire was edited by the ABSTC and Marketing Horizons, Inc. (with input from the NCGA and the NC-205 Regional Committee) to be more efficient and provide additional information. The 2001 results validated the key finding from 2000 that a large majority of Bt corn growers were implementing the proper non-Bt corn refuge size and distance requirements. Adherence to the distance requirement improved in 2001 vs. 2000, as did awareness of IRM requirements in the corn/cotton region.

The amended Bt corn registrations, granted October 15, 2001, require continuation of annual surveys to assess grower adherence to IRM requirements. Further, the registrants were asked to address the potential impact of non-response, the statistical sensitivity of the sample size, and "the reasons, extent, and potential biological significance" of non-compliance. Thus, the Subcommittee, after consultation with the Agency, NCGA, and NC-205, and in collaboration with Marketing Horizons, Inc., initiated a third survey during the 2002 season. As required in item 9 of part c of the amendments entitled, "IRM Education and IRM Compliance Monitoring Programs", a preliminary summary of results from the 2002 survey was presented to EPA by the Subcommittee on November 14, 2002. This report along with the survey questions and complete set of results from Marketing Horizons, Inc. are being submitted as the final written summary of the IRM survey for 2002.

B. 2002 IRM Grower Survey Methodology

The Subcommittee conferred with the Agency, the NCGA, members of NC-205, and Marketing Horizons, Inc. in developing the 2002 survey. It was agreed that the design of the 2001 survey (submitted to the Agency with results on January 31, 2002) was consistent with the survey objectives outlined in the amended Bt field corn registrations. Minor changes were made to reflect revised IRM requirements and to make most effective use of the respondents' time. In addition, the total corn acreage per farm criterion (minimum of 200 acres) was lowered to a minimum of 100 acres in the corn/cotton area of the South to more accurately represent the average corn acreage per farm in this region. The survey was conducted during the growing season in 2002 in an effort to obtain the most accurate assessment of planting practices and the effectiveness of IRM educational tools (previous surveys were done after harvest). A conscious effort was made to keep the survey instrument as consistent with 2001 as possible, which combined with the relative similarity of the requirements, enhances the value of year-to-year comparisons.

The geographic regions surveyed in 2002 were consistent with 2001, and represented areas with significant grower adoption of Bt corn (150 samples in Eastern IA/Northern IL and 200 samples in SD/MN/NE/Western IA), areas where insecticides historically have been sprayed for control of Lepidopteran pests (100 samples in KS/OK/TX), and areas where both Bt corn and Bt cotton may be grown simultaneously (100 samples in NC/SC/Southeast MO/TN/MS). Sample sizes were unchanged from 2001, and results were weighted to reflect the actual distribution of corn acres in each region.

The telephone survey was conducted between July 1st and 25th, 2002, and reached a total of 551 Bt corn growers stratified across the four regions. Respondents were identified as decision-makers who farmed a minimum of 200 acres of corn (100 acres in the South) and 25 acres of Bt corn in 2002, and were not employed in the ag-chemical or seed industries. An incentive payment of $10 was used to increase participation in NC/SC/Southeast MO/TN/MS according to standard practice in the region.

The survey questionnaire sequentially assessed the grower's actual refuge implementation practices, recall of specific refuge requirements on an unaided basis, aided awareness of the requirements with prompting, and feedback on information sources. It was professionally designed to provide an unbiased and statistically robust evaluation of adherence by Bt corn growers to the IRM requirements. The researchers conducting the survey provided no up-front indication that it was related to IRM, and assessment of whether the grower had the appropriate refuge was obtained prior to the term "IRM" being mentioned or implied. All respondents remained anonymous.

Marketing Horizons, Inc. indicated that the initial refusal rate was no higher than other agricultural marketing surveys, and the frequency of in-survey hang-ups was very low (<2%). They concluded that the refusals and hang-ups did not bias the results in any way. Marketing Horizons, Inc. further concluded that the sample size of 550 growers represents a statistically valid population from which accurate assessment of adherence to IRM requirements can be made. This conclusion is supported by the fact that independent samples across years have

resulted in consistent responses to objective inquiries that would not be expected to change significantly (e.g., number of fields, insecticide use history, sources of IRM information, etc.).

C. 2001 Survey Results

Farming Operations

Participants in the study reported planting an average of 502 corn acres in 2002, 57% of which was Bt corn (compared with 567 corn acres and 51% Bt corn in 2001). The average number of corn fields across all regions was 8.3, a slight decrease from 2001, while the average number of Bt corn fields increased slightly to 5.3. Cotton Belt corn growers, despite having the lowest total corn acreage, reported the highest number of corn fields, at 14.6.

Refuge Requirements

The large majority of Bt corn growers (86%) planted at least the minimum required refuge size in 2002, which was not statistically different (95% confidence level) from the 87% recorded in 2001. Ninety-two percent of all growers had at least a 10% non-Bt corn refuge or more (25% or more in the corn/cotton region), indicating that many who were not within the appropriate refuge size requirement nonetheless had some refuge that contributed to the mitigation of resistance. Adherence to the refuge size requirement remained at a high level in all regions in 2002, and none of the regional results were statistically different from 2001. The corn/cotton region continued to have somewhat less adherence to the refuge size requirement than the Corn Belt regions, with 77% of growers having at least a 50% non-Bt corn refuge.

Analysis of 2002 results for refuge distance revealed that 89% of Bt corn growers planted all of their Bt corn fields within the required ½ mile of a non-Bt refuge (unchanged from 2001). An additional 2% of growers (therefore 91% in total) planted at least 2/3 of their Bt corn fields within the required ½ mile of a non-Bt refuge.

Analysis of the refuge distance requirement data on a *field* basis indicated that 94% of all Bt corn fields were within ½ mile of a non-Bt refuge (not statistically different from 91% in 2001). The 2002 results also saw continuation of a trend toward more in-field and adjacent refuges rather than separate fields. In-field refuges accounted for 65% of the total, 21% of refuges were directly adjacent, and just 14% of refuges were separated by some distance – the latter being a statistically significant decrease from 2001, when 20% of refuges were separated by distance.

Grower Awareness and Attitude toward IRM

The attitude of growers remains decidedly positive, with 93% believing that IRM is important. Awareness of IRM requirements and familiarity with information sources on the part of Bt corn growers showed marked improvement in 2002 vs. 2001:

- 88% of Bt corn growers said they were aware of IRM requirements, up from 80% in 2001. Awareness of IRM requirements in the corn/cotton region increased significantly for the third consecutive year (from 58% in 2000 to 74% in 2001 to 81% in 2002), demonstrating the impact of enhanced educational efforts in the region.
- 79% of respondents recalled receiving IRM information from their seed company, compared with 71% in 2001.

- 89% of Bt corn growers said they received enough information to properly implement a refuge in 2002, an increase from 74% a year earlier.
- When asked why some Bt corn growers do not follow IRM guidelines, just 15% of the respondents in 2002 gave "unaware" as the reason, while 24% had mentioned "unaware" in 2001.

Each of these positive changes in grower awareness represents a statistically significant difference in 2002 compared with 2001.

Insecticide Use for Corn Borer Control

Participants were asked a series of questions on insecticide use patterns, and the results confirmed findings from 2001 that insecticide use to control corn borers has decreased since the introduction of Bt corn. Almost 80% of the growers who used insecticides regularly (four or five of the previous five years) reported that they have decreased their insecticide use, 60% describing the reduction as *significant*.

IRM Education

As in previous years, respondents were asked to rate the importance of specific sources of IRM information and communication tools. Seed companies and seed dealers were considered the most important sources of IRM information, and 79% and 74% of the respondents, respectively, reported having received IRM information from these two sources in 2002. These preferences and actual practices are consistent with the findings of the earlier surveys. Additional information sources of note were farm publications, cooperative extension, ag chem retailers, national and state corn growers associations, and crop consultants. On average, growers recalled having received about four pieces of IRM information, and as seen in 2001, adherence to the refuge size requirement increased with the number of information sources recalled.

D. Conclusions and Next Steps

The ABSTC is pleased with the results of the 2002 Insect Resistance Management Grower Survey for Bt Field Corn, which continue to demonstrate that the overwhelming majority of Bt corn growers understand the importance of IRM and are following IRM requirements. The steady level of adherence was not unexpected given the high baseline established in 2000, and is seen as a function of the consistency of the requirements over years and the success of industry-wide education efforts. The continued trend toward fewer Bt corn fields separated by distance from non-Bt refuges helps to ensure overall adherence, and the finding that 94% of all Bt corn fields are within ½ mile of a non-Bt refuge indicates that the current level of adherence is contributing to the durability of the technology.

The significant improvement in awareness of IRM requirements can be directly attributed to the education efforts of the ABSTC and Bt corn stakeholders, and is further evidence that the consistency of IRM requirements and messaging is paying dividends. The remarkable improvement in awareness among Bt corn growers in the corn/cotton region continued, having risen to 81% in 2002 from just 58% two years ago. Overall, 93% of the respondents believe that IRM is important – and although specific recall of the requirements at a point in time may be

limited, the expectation of the ABSTC is that prior to planting Bt corn growers will consult the many IRM reference materials available to them.

The survey continues to provide valuable insight into the attitudes and behaviors of Bt corn growers that may be used to shape future education and compliance programs. Although awareness improved in 2002, concomitant improvement in adherence with the requirements did not. This is attributable in part to the high base level of adherence mentioned above, but also appears to reflect the value growers place on the technology. Further intensification of Bt corn cultivation was observed in 2002, and the reasons for non-compliance included several "economic" factors, e.g., "want total borer control", and "yield concerns", as well as "convenience" factors, e.g., "workload" and "don't have time". Bt corn technology provides considerable value through yield preservation, production efficiency, reduction in pesticide usage, and safety, and given the current difficulties in the farm economy, there is considerable pressure on growers to capture as much of that value as possible. The challenge to the Bt corn industry will be to use this recognition of value as a means of improving growers' appreciation for the importance of IRM as the best way to preserve the technology over the long-term. Certainly elements of the Compliance Assurance Program such as the phased compliance approach, combined with the industry's ongoing education plan, should strengthen growers' stewardship of this technology in the future.