

# PEST MANAGEMENT IN REDUCED-TILLAGE SOYBEAN CROPPING SYSTEMS

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Conservation tillage is defined as a tillage system that reduces the loss of soil and water by retaining protective amounts of residue cover on the soil surface (Manning & Fenster 1983). This includes both minimum or reduced tillage and no-tillage. From 60–85% of the total crop acreage in the U.S. will be grown using conservation tillage methods by the year 2000 according to various estimates (in Hinkle 1983). Accordingly, soybean production via conservation tillage methods has been rapidly increasing during the past decade.

Conservation tillage practices used in soybean production vary from one geographic location to another. In the northern soybean growing regions of the U.S., growers are planting into corn or soybean residue with minimal or no tillage. In the southern and southeastern regions, growers are double-cropping soybean following wheat harvest via conservation tillage methods. With double-cropped soybean, the interest in conservation tillage is not only with the savings in soil, water, and labor, but also in less delay in planting time following wheat harvest.

Reasons for soybean producers using conservation tillage methods are the same for other crops: reduced soil erosion, conservation of moisture, and reduced labor and fuel costs. Presently, corn is the leading crop produced by conservation tillage (King 1983). Soybean has lagged behind corn for various reasons which are now changing. The development of good post-emergence soybean herbicides, development of better planters and drills, and the use of narrow rows to aid in weed control have all contributed to the adoption of no-tillage soybean.

Conservation tillage can have a dramatic effect on arthropod fauna, both pest and beneficial species. This is most often a result of the residue cover which serves to modify the arthropod's habitat. This modification usually is a result of the lowering of soil temperature, greater moisture conservation, and changes in the density and diversity of weed populations which interact with the arthropod fauna. Also, tillage serves to change the placement of organic matter which, if turned into the soil, can have an effect on insects and other arthropods.

Much of the earlier discussions on the effects of conservation tillage practices on insects dealt with corn pests (Musick 1970; Gregory & Musick 1976), due to the greater number of damaging pests in corn and to the greater interest and ability to grow corn by conservation tillage methods. Recently, more information is becoming available on the effects of tillage on soybean insects (House & Stinner 1983; Troxclair & Boethel 1984; Hammond & Funderburk 1985). This paper will examine the influence of conservation tillage on arthropod fauna, concentrating on pest and beneficial insects as they relate to soybean insect pest management.

## Pests

Damage from soybean pests was expected to increase as conservation tillage practices were adapted. This generalization was based on the same philosophy present when corn began to be grown by alternative methods. However, a widespread increase in corn pests has not occurred, and the same will probably hold true for soybean. However, as with corn, various pest species are affected by tillage. Their life histories are altered as tillage practices vary; thus, each species needs to be examined closely.

There are many phytophagous insects which have been examined with regard to conservation tillage practices. Most of these insect pests have been monitored during a general sampling program of arthropods associated with soybean grown under different management systems.