

Integrated weed control in major crops in field crop rotation

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*To achieve a high agrobiological and economic effect in weed control, it is necessary to apply a scientific approach. The great biological diversity of harmful vegetation, its varying sensitivity to modern herbicides and other control methods make it necessary to systematically assess the degree of weed infestation and to take operational decisions to maintain lower weed density. Modern agriculture has a large number of methods, each of which has specific capabilities for weed control. The most appropriate, economically most efficient and environmentally safest is **integrated weed management**. It includes the application of various methods and means – mechanical, physical, chemical, biological, etc., which are combined in a differentiated manner according to the composition of the weed flora, the economic thresholds of weed harmfulness and the specific agro-environmental conditions.*

Competence and precision are required when applying integrated weed management. Every specialist must be well acquainted with the biological and ecological characteristics of the individual weed species and their competitive relationships with the cultivated plants, as well as with the nature and effectiveness of the different control methods and means. Integrated weed management must be carried out timely and with high quality, using suitable and well-maintained machinery. In addition, account must be taken of its direct effect and after-effect on agricultural crops, other harmful organisms, soil fertility and the environment. The main objective of this type of weed control must be to achieve high agronomic and economic results without disturbing the biological balance in nature, the purity of agricultural produce and the environment.

Through agronomic measures for limiting weed infestation the cultivated plants are enabled, to the greatest possible extent, to withstand weed competition, to outgrow weeds in their development and to make the fullest possible use of environmental factors. The main human activity in growing agricultural crops is directed precisely towards creating such a set of conditions as to ensure healthy, vigorous and competitive stands.

One of the most important agronomic measures in weed control is the establishment of a **proper crop rotation**. The alternation of crops must be scientifically based on a rational, economically advantageous structure of the arable land, in accordance with the ecological and terrain characteristics of the region, with a view to increasing soil fertility and the yield of individual crops. The change of crops is inseparably linked to the complex of agronomic measures and especially to soil tillage, fertilisation, plant protection, control of soil erosion and others.

The role of crop rotation is determined by the fact that the types of cultivated plants and the way they are grown create different conditions for the emergence, growth and development of weeds. Growing the same crop or similar crops leads to weed infestation mainly with those weeds that tolerate best the conditions created. For example, winter cereal crops are infested by winter-annual, early spring and ephemeral weeds, since winter-annual and ephemeral weeds emerge in autumn almost simultaneously with the crops, while early spring weeds emerge early in spring. At that time the cultivated plants are in their initial stages of development and are unable to suppress weed development. Late spring weeds do not find suitable conditions for development in winter cereal stands, as they emerge when the cereals have already developed and strongly suppress them.

In continuous monoculture it has been established that the species composition of weeds decreases, but at the same time the density of the adapted species increases. These weeds multiply very rapidly and within a short period can smother the crops, especially those with a closed canopy.

Re-sowing of crops that are attacked by parasitic weeds is extremely harmful and unacceptable. For example, on areas infested with sunflower broomrape, if conventional hybrids are not resistant to the parasite, sunflower can be grown only after 6–7 years. In recent years, due to non-compliance with proper crop rotations, the occurrence of broomrape has also been established in oilseed rape. The parasite affects not only the quality of the harvested yield but also its quantity.

Practical examples show that the biology of different crops and the applied cultivation techniques have varying influence on the weed infestation of fields. Weed control is more successful when crops that are not infested by

the same weed species alternate in the crop rotation.

Other reasons for observing crop rotations are the different requirements of cultivated plants for nutrients, as well as their differing capacity to uptake them from the soil. Crop species extract different amounts of nutrients from the soil and do not exert the same influence on its nutrient regime. The main factors determining plant nutrient requirements are the type and size of the yield. Some plants extract more nitrogen from the soil, others – phosphorus, and still others – potassium. For example, leguminous plants deplete the soil of phosphorus and potassium, while increasing its nitrogen reserves at the expense of atmospheric nitrogen, assimilated by their root nodule bacteria. The nutrients removed from the soil are returned to it again in amounts depending on the intended use of the yield. Another example: for forage crops the yield is intended for feeding farm animals and a larger part of it can be returned to the soil through farmyard manure, whereas for other crops only a very small part of it returns to the soil.

An important element of integrated weed management is *timely and properly carried out soil tillage*. Soil tillage improves aeration and the physical properties of the soil, activates microbiological activity, contributes to maintaining soil fertility, creates a suitable seedbed for crops and, not least, serves for weed control. The effectiveness of weed control depends on the application of differentiated soil tillage according to weed infestation and specific conditions.

The most widely used weed control method in practice is the *chemical method*. The great interest in it, its rapid expansion and improvement are due to the fact that, compared to hand weeding and other mechanical methods of weed destruction, it has a number of agronomic and economic advantages. Above all, chemical control is more effective and is carried out quickly and easily, as it can be mechanised. Most herbicides are applied to the soil and destroy the sprouts and seedlings of susceptible weeds before the emergence of the cultivated plants. Their proper use makes it possible to reduce, to varying degrees, mechanical soil tillage.

It is an indisputable fact that only the professional, adequate, specific, scientific and well-founded combination of methods for limiting weed infestation leads to the achievement of high results in integrated weed management. These are basic rules which, if observed, will ensure high and sustainable yields of agricultural crops.