



Résumé. Réduire les herbicides en culture de maïs

La gestion intégrée des adventices (*Integrated Weed Management*) recouvre de façon assez large l'emploi d'un grand nombre de méthodes qui peuvent être combinées et appliquées de façon à constituer une stratégie. Le maïs est une culture sarclée très répandue en Europe à laquelle de telles stratégies, fondées sur des combinaisons de méthodes chimiques et non chimiques peuvent être appliquées.

Des réductions substantielles d'herbicides peuvent être obtenues. Les techniques employées sont variées : technique du faux semis, lutte mécanique en pré-levée de la culture, travail du sol dans l'inter-rang, traitement dirigé ou traitement en plein à doses réduites lorsque cela est approprié. Le travail du sol dans l'inter-rang est un élément important de la gestion intégrée des adventices du maïs. Il est réalisé soit en supplément des traitements dirigés (désherbinage), soit pour contrôler des adventices qui n'ont pas été éliminées par la technique de désherbage précédent. Le travail du sol dans l'inter-rang est facile à conduire avec une bineuse ou un cultivateur rotatif. Au cas où des herbicides seraient quand même épanchés, leur application dirigée réduit les surfaces traitées. La consommation d'herbicides peut être réduite de 70 % par traitement dirigé, sans modification de la dose sur les surfaces traitées.

Il est recommandé d'utiliser des cultures intermédiaires et de diversifier les rotations de cultures. Cela permet de limiter à une seule année les effets négatifs d'un faible contrôle des adventices et de prévenir les phénomènes de résistance chez les adventices, avec leurs conséquences en termes de coûts et d'impact sur l'environnement. Un suivi soigneux et régulier des infestations d'adventices aide à choisir les solutions adéquates et à identifier à des stades précoces, tout au long de la stratégie, les espèces résistantes aux herbicides.

For further information please contact:

Bo Melander, Department of Integrated Pest Management,
Faculty of Agricultural Sciences, Aarhus University, Forsøgsvej 1,
4200 Slagelse, Denmark
Tel: (+45) 8999 3593. Email: bo.melander@agrsci.dk.

About ENDURE

ENDURE is the European Network for the Durable Exploitation of Crop Protection Strategies. ENDURE is a Network of Excellence (NoE) with two key objectives: restructuring European research and development on the use of plant protection products, and establishing ENDURE as a world leader in the development and implementation of sustainable pest control strategies through:

- > Building a lasting crop protection research community
- > Providing end-users with a broader range of short-term solutions
- > Developing a holistic approach to sustainable pest management
- > Taking stock of and informing plant protection policy changes.

Eighteen organisations in 10 European countries are committed to ENDURE for four years (2007-2010), with financial support from the European Commission's Sixth Framework Programme, priority 5: Food Quality and Security.

Website and ENDURE Information Centre

www.endure-network.eu

This publication was partially funded by EU grant (Project number: 031499), and is catalogued by the ENDURE Executive Committee as ENDURE Integrated Weed Management Case Study - Guide Number 1, published in September, 2008.

© Photos, from top to bottom: BBA, B. Hommel; INRA, J.F. Picard; BBA, B. Hommel; INRA, J. Weber; A.S. Walker; INRA, C. Slagmulder; BBA, B. Hommel; Agroscope ART; SZIE; INRA, N. Bertrand; Vitropic; INRA, F. Carreras

Maize Cropping With Less Herbicide

Bo Melander, Aarhus University, Denmark
Paolo Bàrberi, Sant'Anna School of Advanced Studies Pisa, Italy
Nicolas Monier-Jolain, National Institute for Agricultural Research, France
Rommie van der Weide, Applied Plant Research, Wageningen UR, The Netherlands
Arnd Verschwele, Julius Kühn Institute, Germany
Maurizio Sattin, National Research Council, Italy



Successful IWM in maize © Bo Melander, University of Aarhus, Denmark

Maize Cropping With Less Herbicides

More use of preventive, cultural and physical methods in weed control programmes for maize can reduce the need for herbicides

Maize is a widespread row crop in Europe with a high demand for weed control in its initial growth phases. The standard chemical solution in many European regions typically includes two herbicide applications. However, there are several options for achieving substantial reductions in herbicide input for maize through the adoption of integrated weed management (IWM).

Why IWM?

IWM is a broad term covering many methods that can be combined and applied in various ways to constitute an IWM strategy. Essentially, IWM implies that weed control is not based solely on herbicides but takes advantage of other non-chemical measures to control weeds. IWM mainly serves two purposes: to reduce herbicide input and to supplement herbicides with insufficient efficacy. Many non-chemical control methods are applicable for IWM in maize and we suggest methods that are practical and reasonably cost-effective.

Cultivation before crop emergence

A stale seedbed followed by pre-emergence cultivation should be used whenever possible. This can lower weed density, delay weed emergence and make those weeds eventually emerging more susceptible to post-emergence operations. A stale seedbed can be applied with either a weed harrow or seedbed cultivator. Only gentle pre-emergence cultivation can be used shortly before crop emergence in order not to injure germinated crop seeds. However, glyphosate at low doses may replace pre-emergence cultivations where tillage is less effective or applicable (for example, heavy soils or low water availability).



Inter-row cultivation in maize with a rolling cultivator © Henning C. Thomsen, University of Aarhus, Denmark

Inter-row cultivation

Soil cultivation between maize rows is recommended as a standard practice either to supplement band-spraying or to control weeds surviving previous weed control actions. Annual weeds are easily controlled even at advanced growth stages and perennials can be hampered by repeated cultivations. Inter-row cultivation is easily conducted with traditional hoes or rolling cultivators. Steering can be done manually or by camera-based systems for automatic guidance of the cultivator. Inter-row cultivation can also lower the selection pressure exerted by herbicides and improve crop growth through better soil moisture conservation and aeration.

Band-spraying

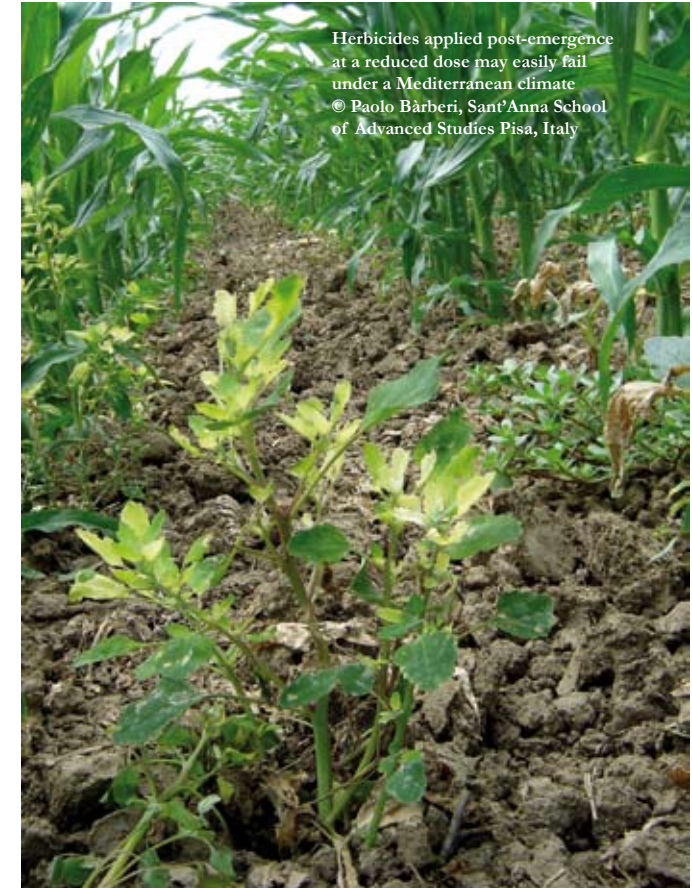
Spraying herbicide on only the maize rows can save up to 70% of the amount of herbicides normally applied by broad-spraying. Band-spraying is supplemented by inter-row cultivation and herbicide savings are achieved without lowering the dose in the target area. Band-spraying is still very little used in Europe, but the technology could become a significant tool for maize cropping with less herbicide input.

Reduced herbicide dose

Band-spraying is usually more time consuming than broad-spraying. Alternatively, broad-spraying at a reduced dose may follow a stale seedbed plus pre-emergence cultivation or just pre-emergence cultivation under Northern European conditions. Reduced doses should be accompanied by an increased awareness of the risk of developing herbicide resistance. Careful and regular monitoring of the weed flora is thus needed. Reduced doses are not recommended for Mediterranean conditions because of insufficient overall efficacy

Diversification of crop rotations and cover crops

The amount of weeds surviving weed control is coincidentally more likely to increase with less reliance on herbicides. This necessitates including IWM in a wider context that goes beyond the single crop. We suggest maize growers consider cover cropping and increased diversification of their crop rotations to counteract future weed problems. A high diversification is obtained when crops with different life spans and growing seasons are included in the crop sequence. Cover crops suppress weed growth in different ways, and they can be inter-seeded with the main crop and form a living mulch, or they can be grown in periods when main crops are not present.



Herbicides applied post-emergence at a reduced dose may easily fail under a Mediterranean climate © Paolo Barberi, Sant'Anna School of Advanced Studies Pisa, Italy