Global HRAC supports combination or sequence of active ingredients belonging to former Groups N and K3 (new Group 15)

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Weed control is an important method of safeguarding the yield and quality of crops. Herbicides provide farmers with an effective and economic weed control tool, which can be integrated with different cultural techniques in a flexible and sustainable way to ensure crop production is optimized. Maintaining the effectiveness of herbicides and reducing the risk of selecting for herbicide resistance requires the implementation of certain strategic elements. One of the most important of these is the careful rotation of herbicides with different modes of action (MoA) against the targeted weeds.

To enable farmers to identify a herbicide's mode of action easily and quickly, HRAC developed a letter-based classification system back in the 1980s. Since then, many new active ingredients, some with new modes of action, have entered the market. Additionally, new research methods have helped to further clarify the precise modes of action of herbicides already on the market. In order to capture all these new developments, in January 2020, following consideration of the latest scientific findings, HRAC updated the mode of action classification scheme, adding new mode of action classes and reviewing the correct positioning of each active ingredient.

Moreover, a transition from the former letter-based system to a new numeric based system was implemented to bypass the limitation in the number of classes set by the letter-based system and to foster use in geographical areas in which the Latin alphabet is not commonly used.

For HRAC group N – "Inhibition of lipid synthesis (not ACCase)" - it turned out that most of its active ingredients needed to be moved into HRAC group 15 (K3; Inhibition of Very Long-Chain Fatty Acid synthesis - VLCFAs) – and class N was deleted. However, in contrast to many other HRAC groups (e.g., 1 (A) – ACCase, 2 (B) – ALS, 9 (G) – EPSPs, 27 (F2) – HPPD, etc.), the inhibition of VLCFAs takes place in a multi-enzyme system, which shows a complex pattern of substrate specificity to individual active ingredients. Specific target sites have not yet been identified (4).

Indeed, it is believed that **herbicides in HRAC group 15 (K3) might exhibit a multi-site or at least a multi-enzyme mode of action, with several elongases being involved**, and that there could be significant differences between the herbicides. Further investigations are required to identify the specific target sites of the different members of group 15 (K3) in more detail. So far, weed resistance to inhibitors of VLCFAs has only rarely been observed and, in most cases, no cross-resistance was reported.

Combinations or sequences of products containing active ingredients from different HRAC groups are part of resistance management recommendations. In line with this advice, it is common practice for European farmers to tank-mix or sequence products of the former HRAC groups N and K3 to control grasses like *Alopecurus spp* or *Lolium spp*. A similar approach to broadleaves weeds (e.g. *Amaranthus* spp) applies to other regions of the World. Such an approach has been in use for years with only few cases of resistance evolving against group 15 inhibitors active on grasses (1, 2 & 3).

Based on this experience and the fact that HRAC group 15 (K3) covers a multi-enzyme mode of action with a complex pattern of substrate specificity, **combinations or sequences of products containing active ingredients from the former HRAC Groups N and K3 (new Group 15) are still supported by HRAC.**

Based on further investigation and their findings a review of HRAC group 15 (K3) might be required.

Bibliography

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