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ANTI-RESISTANT HERBICIDES COMPOSITIONS

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The occurrence and spread of herbicide-resistant weed biotypes pose a major threat to agricultural production. Currently, there are no comprehensive solutions to fully resolve the issue of resistance. However, through the integrated application of herbicides, it is possible to reduce the directional selection pressure exerted by herbicides and thereby delay the emergence of target-site resistance (TSR) in weeds. To effectively prevent the development of resistance, herbicide mixtures must meet three main requirements:

1. The components of the mixture must have different mechanisms of phytotoxicity.

2. The spectrum of activity of the components must be similar.

3. The interaction between the components must be synergistic or at least additive.

Tank mixes and complex herbicide formulations used for protecting cereal grain crops meet these criteria. These typically consist of acetolactate synthase (ALS) inhibitors and synthetic auxins, which feature similar activity spectra and are characterized by synergistic interactions.

For the protection of winter wheat crops during the autumn growing season, a three-component tank mix was created. Its components include: diflufenican – a carotenoid synthesis inhibitor whose target site is phytoene desaturase, metribuzin – an electron transport (ET) inhibitor in photosystem II (PS II) of chloroplasts, carfentrazone – an inhibitor of protoporphyrinogen oxidase (PPO), an enzyme in the chlorophyll biosynthesis pathway. Although the interaction between carfentrazone and metribuzin is antagonistic on its own, in the presence of diflufenican, the nature of the interaction shifts to additive. Thus, this composition meets the necessary requirements and can be considered anti-resistant.

To prevent resistance development in corn crops, a synergistic tank mix combining a carotenoid synthesis inhibitor tolpyralate, targeting hydroxyphenylpyruvate dioxygenase [HPPD], with ET inhibitor in PS II terbuthylazine can be effective. The synergistic interaction of these components occurs because tolpyralate's inhibition

of plastoquinone synthesis (an electron carrier in PS II) increases the efficiency of terbuthylazine's ET inhibition. This synergistic interaction ensures high weed control efficiency and forms the basis for its effectiveness against weed biotypes with increased herbicide tolerance.

A herbicide tank mix developed for sunflower crop protection also meets anti-resistance requirements. This mixture consists carotenoid synthesis inhibitoof aclonifen, whose potential target site is the enzyme solanesyl diphosphate synthase, and ET inhibitor in PS II prometryn, whose interaction is additive. In terms of weed control efficiency, this mixture is on par with classic herbicide formulations while simultaneously meeting the standards required for anti-resistant herbicide mixtures.

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