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Current Status of Herbicide-resistant Weeds in Malaysia

Herbicide resistance is the inherited ability of a plant to keep growing and reproduce even after being treated with a dose of herbicide that is normally lethal to the weed. Resistance may occur naturally due to selection or it may be induced by certain technique such as genetic engineering. Under the herbicide selection pressure, susceptible plants are eliminated while herbicide-resistant plants survive to reproduce without competition from susceptible plants. If the same herbicide is continuously used, more resistant plants will evolve into a dominant species in the population.

The evolution of herbicide-resistant weed biotypes is increasing in Malaysia. The intense selection pressure imposed by modern agricultural management activities, such as the application of synthetic herbicide is the main reason for the unusually rapid evolving of herbicide-resistant weeds in Malaysia. This phenomenon is intensified due to the monoculture of oil palm, rubber or rice etc. To date, twenty weed biotypes resistant to herbicide have evolved herbicide resistance in agriculture in Malaysia. The first case of herbicide-resistant weed was reported in a rubber plantation where *Ischaemum rugosum* Salisb. was found to be resistant to paraquat in the year 1989. Four weed species, namely, *Eleusine indica* (L.) Gaertn., *Clidemia hirta* (L.) D. Don, *Oldenlandia verticillata* L., and *Chromolaena odorata* (L.) R. M. King & H. Rob., which are found in oil palm plantations and/or nurseries have evolved resistance against herbicides in the states of Terengganu, Kelantan, Pahang, Kedah, Selangor, Perak, Johor and Sarawak. Most of these weed biotypes are resistant to glyphosate, paraquat and metsulfuron. *E. indica*, which is a problematic weed that grows in immature oil palm plantations and nurseries, has evolved resistance to multiple herbicides, such as glyphosate, paraquat, glufosinate and/or fluazifop. Thirty-three first cases of herbicide-resistant goosegrass have been reported worldwide, fives cases were reported in Malaysia. Moreover, Malaysia is the first country that documented the occurrences of multiple resistant goosegrass toward two or more sites of action. However, there are alternative herbicides like topramezone, diuron, imazethtpyr, indaziflam, ametryn, flumiozaxin, oxyfluofen and sodium chlorate which can be employed to control *E. indica* in oil palm. In contrast, *E. indica*, *O. verticillata*, and *I. rugosum* are resistant to paraquat and/or glyphosate, respectively, and these grow in rubber plantations and/or nurseries.

A total of nine weed species, namely, *Fimbristylis quinquangularis* (Vahl) Kunth, *Limnocharis flava* (L) Buchenau, *Sphenoclea zeylanica* Gaertn, *Sagittaria guayanensis* Kunth., *Bacopa rotundifolia* (Michx.) Wettst, *Limnophila erecta* Benth., *Leptochloa chinensis* (L.) Nees, *Echinochloa crusgalli* (L.) P.Beauv. and *Oryza sativa* L. (weedy rice) were recognised to be resistant to several herbicide groups. Recently, the first case of weedy rice that is cross-resistant to imazapic and imazapyr in a rice field of a company has been documented. The resistant weedy rice is found to be sixty-seven fold more resistant to

premix of imazapic and imazapyr than the susceptible weedy rice.

These findings provide an early warning to growers and plantation managers regarding the evolution of multiple herbicide resistance in weeds after the frequent application of the same herbicides. This alarming case in the history of herbicide resistance evolution poses a great challenge for the sustainable use of the agrochemical resources of glufosinate, glyphosate, fluazifop and metsulfuron in plantations. Nevertheless, a possibility still exists for improving the chemical control strategy by introducing new active ingredients applied in combination with the existing herbicides in the market. Agrochemical companies are urged to develop several premixed herbicides, and substantial research are required to find suitable tank mixtures for the oil palm and rubber industries that provide a broad spectrum weed control and delay the evolution of herbicide resistance.

Heavy reliance upon herbicides and in particular the same chemicals could lead to failure in weed management due to the fast evolution of herbicide resistance. Mitigating the evolution of herbicide resistance is dependent on reducing the herbicide selection pressure through diversified weed management practices. Management diversity can be achieved by applying herbicides in mixtures, sequences, or rotation coupled with mechanical, biological and cultural methods.

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When you meet someone better than yourself, turn your thoughts to becoming his equal. When you meet someone not as good as you are, look within and examine your own self.

Confucius