

## **Green nano-emulsion intervention for water-soluble glyphosate isopropylamine (IPA) formulations in controlling *Eleusine indica* (*E. indica*).**

### **ABSTRACT**

This article describes the development of environmentally friendly nano-emulsion system for water-soluble herbicide application. Pseudoternary phase diagrams were established in the emulsion system of fatty acid methyl esters (FAMEs)/alkylpolyglucosides (APG) and/or 3-(3-hydroxypropyl)-heptamethyltrisiloxane (organosilicone)/water encompassed with 41% (w/w) glyphosate isopropylamine (IPA) as herbicide active. Pre-formulations were selected from isotropic (L) region in the phase diagrams and their emulsion system characteristics were determined. The microemulsion systems were chosen and then dispersed into water using low-energy stirring method (200 rpm for 5 min). Oil-in-water (O/W) nano-emulsions were formed with particle sizes of diameter less than 200 nm. The nano-emulsion systems showed significantly lower surface tension than a commercial formulation (Roundup®). In the biological application study, treatments of nano-emulsion formulations and Roundup® were applied on narrow-leaved weed *Eleusine indica*. Multiple doses of glyphosate IPA of the treatments were applied for the construction of dose–response curves for determination of effective dose (ED50). The nano-emulsion formulation showed lower ED50 was 0.40 kg a.e./ha in controlling the weed than Roundup® was 0.48 kg a.e./ha. This finding suggested that the possibility of using nano-emulsion system to increase penetration and uptake of glyphosate IPA.

**Keyword:** Nano-emulsions; Glyphosate; Alkylpolyglucosides; Fatty acid methyl esters; *Eleusine indica*.