

CHAPTER I INTRODUCTION

A. Background of study

Goosegrass (*Eleusine indica* L.) is a widespread weed in various areas such as lawns, golf courses, and specially cultivated crops like in orchards or Oil palm plantations (*Elaeis guineensis* Jacq. L.) in Indonesia. This weed has been reported to influence the growth of plants, lead to production loss by competing directly with crops in the field of using sunlight, nutrition, water, and rise the prevalence of the disease *Phytophthora* spp. on the plants (Chee *et al.*, 1990; Teng & Teo, 1999). Baki (2006) gave details about those losses in the Asia and Pacific region ranging from 10 to 25%.

Herbicide application is one of the most effective methods to control weeds. Compared with the other methods, such as manual hand weeding or mechanical weeding, herbicide application is one of the cheaper methods, has rapid efficiency, and has less labour cost. However, repeatedly applying one kind of herbicide for the long term can cause weed resistance to this kind of herbicide. In the Oil palm nursery in Indonesia, *Eleusine indica* L. was resistant to Glyphosate (Heap, 2020).

Glyphosate was discovered as a herbicide by John E. Franz in 1970. Glyphosate is one of the herbicides used all over the world. An annual review article reported the amount of 9.7 million kg of the active ingredient of Glyphosate herbicide used in Indonesia. The percentage of utilization of Glyphosate in total herbicide usage is 73/35 in terms of the active ingredient and spray, respectively (Brookes, 2019; Beckie *et al.*, 2020).

The application of Glyphosate herbicide has a crucial environmental impact due to its adverse effect on non-target organisms. Glyphosate application has increased through the years, which brings pressure because of the rapid evolution of Glyphosate-resistance weeds. Thus, its application could impact directly and indirectly ecology and environments by different paths related to toxicity and biodiversity loss and the health of humans and nature. Many researchers have been carrying out scientific overviews on Glyphosate and its degradation product,

amino methyl phosphonic acid (AMPA), accumulated in the environment, in soil, water, and their ecotoxicological concerns (Van Bruggen *et al.*, 2018). Glyphosate structure is a stable compound with divalent metal ions in soil and water (Hansen & Roslev, 2016) that could affect the plant uptake nutrients (Mertens *et al.*, 2018) and contribute to polluting drinking water, especially water contaminants in agricultural areas.

Sulfentrazone belongs to the phenyl-triazolinone herbicide group (Theodoridis *et al.*, 1992). Sulfentrazone is applied as an active ingredient herbicide with excellent managing of grass weeds, broad-leaf weeds, and nutsedge. Sulfentrazone is a weak acid and can be soluble in water with two orders of magnitude between pH 7.5 and 6.0 (FMC Corporation, 1995). Their behaviour in the soil can affect effective weed management and the environment (Reddy & Locke, 1998).

The weed population has intended to be resistant or tolerant to herbicides. For instance, in a case at the Oil palm nursery area of the Palm Oil Plantation of Perkebunan Nusantara., Glyphosate was used to control the weed *Eleusine indica* L. repeatedly and continuously for \pm 26 years. The increased usage of a single herbicide caused the *Eleusine indica* L. population to be challenging to manage and involved the rise in the dose of herbicide application (Nambela, 2019). This problem also happened in Adolina Oil Palm Plantation in North Sumatra, where the population of *Eleusine indica* L. has been reported resistant to Glyphosate and Paraquat after repeated use for 26 years (Lubis *et al.*, 2012). Mature weed *Eleusine indica* L. is also ineffective and controlled using Sulfentrazone herbicide (Tampubolon *et al.*, 2020). Subsequently, the numerous ways to avoid herbicide resistance are alternating herbicide with different types of active ingredients or working methods, time application, linking to crop rotation, and cultivation techniques. The more weed is resistant to the herbicide, the more necessary the large number of herbicide complex mixtures to be utilized in weed control. The growing use of chemical herbicides for weed control has become a dominant feature of modern industrial agriculture and a major environmental and health concern in agricultural systems worldwide.

Based on these above issues, the research on "*The effect of Sulfentrazone and Glyphosate herbicides to control Eleusine indica L. a resistant weed to herbicide*" was conducted in greenhouse conditions in Padang, West Sumatra, Indonesia.

B. Problem of study

1. Examine the effect of two active ingredient herbicides on *Eleusine indica L.* weed.
2. Examine the resistant capacity of *Eleusine indica L.* weed to the herbicide.

C. Objective of study

The objective of the experiment is to determine the effect of Sulfentrazone and Glyphosate herbicides on the resistant *Eleusine indica L.* weed, which is not effectively controlled by the previously selected herbicide.

D. Aim of study

1. To obtain information on the effect of two active ingredient herbicides on the control of *Eleusine indica L.* weed.
2. To obtain which dose of each active ingredient herbicide most effectively controls *Eleusine indica L.* weed.
3. To obtain which time of application of each active ingredient herbicide most effectively controls *Eleusine indica L.* weed.

