The Potential Benefits of Weeds in Sugarcane (*Saccharum officinarum* L.) in Highland and Lowland Fields

Salsabila Abidah Fitria[1], Hanifah[1], Via Clarita Rajagukguk[1], Ahmad Addairobbi[1], Patria Prasasya[1], Nova Ramadina Kafiandari[1], Sylvatera Ayu Puspitasari[2], Puji Lestari Tarigan[1*],

[1]Program Study of Agrotechnology, Faculty of Agriculture, Universitas Pembangunan Nasional "Veteran" Jawa Timur, Surabaya, Indonesia
[2]Department of Horticulture, College of Natural Resources, National Chung Hsing University, Taichung, Taiwan

*corresponding author: puji.lestari.agro@upnjatim.ac.id

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Abstract

In agriculture, weeds are commonly viewed as nuisances that compete with main crops for resources like air, nutrients, light, and space, potentially reducing plant productivity. However, weeds also play a crucial role in ecosystems, contributing to soil fertility through organic matter decomposition, soil erosion prevention, acting as habitats for beneficial insects, and other benefits. Especially for human welfare, for new food and medicine sources. This is in line with the goals of SDGs 2 and 3. This study is concerned with the advantages of weeds in sugarcane fields. Observation conducted in lowland and highland fields. Vegetation analysis using the quadrat method by a 1x1 meter quadrat. There are 3 replications for each sample. Identification of weeds for significant benefits if properly utilized from the literatures. 10 from 13 species in lowland are useful for medicine. They are *Ageratum conyzoides*, *Portulaca oleracea*, *Digitaria ciliaris*, *Phyllanthus niruri* Linn., *Eleusine indica*, *Trianthema portulacastrum*, and *Crassocephalum crepidioides*. Meanwhile, from the highland can be found *Mimosa pudica* L., *Cyperus rotundus*, *Cayratia trifolia*, and *Montanoa hibiscifolia* Benth. All of the 11 weeds in highland have potential for medicine. They are *Mimosa pudica* L., *Amaranthus tricolor* L., *Ipomoea obscura*, *Guizotia abyssinica* (L.f.) Cass., *Chromolaena odorata*, *Eleusine indica*, *Cyperus rotundus*, *Cayratia trifolia*, *Modiola caroliniana*, *Digitaria sanguinalis*, *Montanoa hibiscifolia* Benth. So, majority of weeds in lowland and highland fields are used as medicines. Other utilized as pesticides, soil conservation, biological agencies, livestock feed, fertilizer, ornamental plants, and food.

Keywords: *metabolite, potential, sugarcane, weed*

Introduction

Sugarcane is a common crop for sugar sources in Indonesia. Weeds appear in the sugarcane field, both in the lowland and highland. In crop production, weeds are plants that grow in undesirable locations and are frequently regarded as pests. When they are present on agricultural land, they may compete with the primary crops for growing space, air, nutrients, and weeds, which could lower crop productivity. Additionally, weeds are a natural component of the ecosystem and serve a variety of ecological functions, including preventing soil erosion, providing habitat for insects that manage pests, and improving soil fertility through the breakdown of organic materials.

Despite being viewed as a nuisance, weeds provide advantages that should not be disregarded. Weeds in an ecosystem can act as a natural buffer against soil erosion, particularly in regions that are vulnerable to landslides or topsoil loss. Apart from their ecological advantages, weeds may also offer economic and health benefits. Bioactive chemicals found in certain weeds have been used as components in traditional medicine and the pharmaceutical industry. Certain weeds can be turned into green manure, which raises soil fertility in the agricultural sector. By giving animals natural feed, managed weeds in agroforestry can help integrated farming systems.

Numerous weeds are adapted to endure harsh environments and exhibit considerable therapeutic characteristics acknowledged in traditional medicine systems globally (Ko & Kwahk, 2024). Various compounds, such as alkaloids, tannins, steroids, saponins, phenolic acids, terpenoids, and quinones, have been identified from weeds. It has the potential for cardioprotective, anticancer, antioxidant, antibacterial, anti-insect, and other properties (Tungmunnithum et al., 2018; Javaid et al., 2021).

Weeds also contribute significantly to biodiversity. Weeds provide habitat or food for numerous insects, avian, and other tiny organism. With proper management, sustainable agriculture and environmental conservation plans. Concerning the SDGs the use of wild plants can provide an alternative and essential food source for people, particularly in rural and distant locations. The diversity of wild plants can improve food security by reducing reliance on a few staple crops. Furthermore, the varied contents of plants serve as natural resources for the production of a variety of human welfare products. Therefore, this study aims to identify weeds have several advantages.

Materials and Methods

The research was conducted on a lowland sugarcane field in Kebonagung Village, Sukodono District, Sidoarjo Regency, on Thursday, November 14th, 2024, and a highland sugarcane field in Purworejo Village, Pungging District, Mojokerto Regency, on Thursday, November 21st, 2024. The tools used in identifying weeds in lowland and highland sugarcane fields are plastic rope, wood sticks, plastic bags, and markers. The method uses the quadrat method (Figure 1), which involves observation on a sample plot with an area measured in square units. The steps taken in the activity of identifying weeds in lowland and highland sugarcane fields are as follows:

1. The vegetation analysis method uses a quadrat model of 1x1 meters as a sample unit. There are 3 replications in each location.
2. Identification of the species and local name of the weeds.
3. Identification of the benefits of weeds for ecosystems, plants, animals, and humans.

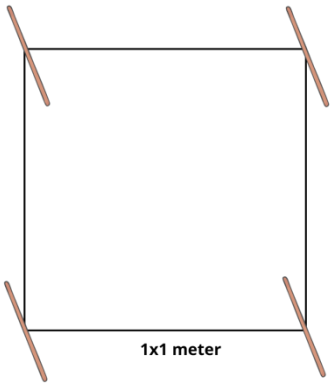

Figure 1. Quadrat method of sampling

Result and Discussion

Weeds are extensively distributed over diverse land types. According to the kind of leaves, most weeds in lowland and highland are broadleaf. Even though weeds in the lowland are a little larger, there are no significant differences in variance between both locations. Broadleaf weeds have wide leaves with network vascular and robust stems. It belongs to a class of dycotiledonea and often disturbs cultivated plants by shading.

External factors such as temperature, humidity, and air pressure influence the type of vegetation. Sugarcane fields in different latitudes have a variation of weeds. For some differences, several species have emerged in both latitudes such as *Cyperus rotundus* L., *Digitaria sanguinalis,* and *Eleusine indica*. Because the kind of narrowleaf weeds tends to have wide adaptability.

Identification of the weed vegetation in sugarcane fields not only brings the result to study about the weeds spread and efficient rid. But, also the potential benefit from each weed. Because the natural sources come from the wild nature. Potential benefits of weed are categorized as traditional medicine, plant elicitors and insecticides, livestock feed, cover crops, fertilizer, and ornament. According to the observation, most weeds are prospectively used as traditional medicine since they have been commonly used in local wisdom to function as natural remedies. Knowledge in society is being passed down as a legacy for future generations. Until now, it has kept on developing with the convergence of new technologies. It is conceivable that certain components present may cure ailments for which no treatment has yet been discovered.

Table 1. Identification of weeds in the sugarcane lowland field

No	Species	Local Name	Potential and Benefits
1.	*Ageratum conyzoides* Linn. (Broadleaf)	Babadotan (Billygoat weed)	Traditional medicine, plant-based insecticides, and plant elicitors
2.	*Portulaca oleracea* (Broadleaf)	Krokot (Little hogweed)	Food, traditional medicine, soil conservation
3.	*Cleome rutidosperma* (Broadleaf)	Maman lanang (Fringed spider flower)	Traditional medicine and plant elicitors
4.	*Cyperus rotundus* L. (Narrowleaf)	Rumput teki (Nutgrass)	Biological agency and livestock feed
5.	*Digitaria sanguinialis* (Narrowleaf)	Rumput jariji (Hairy crabgrass)	Livestock feed
6.	*Digitaria ciliaris* (Narrowleaf)	Rumput cakar ayam (Crabgrass	Traditional medicine
7.	*Amaranthus viridis* (Broadleaf)	Bayam hijau (Slender amaranth)	Traditional medicine and livestock feed
8.	*Phyllanthus niruri* Linn. (Broadleaf)	Meniran (Gale of the wind)	Traditional medicine
9.	*Eleusine indica* (Narrowleaf)	Rumput belulang (Goosegrass)	Traditional medicine and livestock feed
10	*Trianthema portulacastrum* (Broadleaf)	Bishkhapra/krokot laut (Black pigweed)	Traditional medicine
11.	*Brachiaria mutica* (Narrowleaf)	Kolonjono (Para grass)	Livestock feed
12.	*Polygonum aviculare* (Broadleaf)	Keludah (Common knotweed)	Traditional medicine, ground cover crop, and herbicide
13.	*Crassocephalum crepidioides* (Broadleaf)	Sintrong (Redflower ragleaf)	Traditional medicine

a. Medicines

Traditional medicine utilizes natural elements, including flora, fauna, and minerals, that have been recognized for generations for their therapeutic properties in treating diverse ailments. Weeds contain many natural resources for medical purposes. From the lowland can be found *Ageratum conyzoides, Portulaca oleracea, Digitaria ciliaris, Phyllanthus niruri* Linn.*, Eleusine indica, Trianthema portulacastrum,* and *Crassocephalum crepidioides*. Meanwhile, from the highland can be found *Mimosa pudica* L., *Cyperus rotundus, Cayratia trifolia,* and *Montanoa hibiscifolia* Benth. Each botanical has ethnopharmacology potential impending development.

Ageratum conyzoides Linn. is widely distributed throughout various types of land. In the several countries, it has been known to provide numerous medical benefits. An extensive variety of secondary metabolites from *A. conyzoides*, encompassing many chemical classes, including flavonoids, alkaloids, chromenes, terpenoids, coumarins, and sterols, has been isolated and described (Barrett, 2022; Chalal et al., 2021). The study of *A. conyzoides* properties as traditional use to treat wounds and inflammation. Furthermore, the plant has prospective applications in natural antimicrobials, nanomedicine, and drug development (Joseph et al., 2024). Leaves, stems, and roots are parts that can be used. *A. conyzoides* are fairly common in the wild, which allows the availability of many raw resources. The product can be used as an extract, essential oil, or other compound.

Ageratum conyzoides essential oils have been widely researched for their possible medicinal benefits. These oils possess strong antioxidant properties and can be used to prevent and treat oxidative stress-related ailments, such as cardiovascular and neurological diseases (Dangana et al., 2024; Joseph et al., 2024). Thus

far, traditional uses of *A. conyzoides* have included treating wounds, fever, inflammation, respiratory infections, gastrointestinal illnesses, and reproductive concerns (Anand et al., 2022; Joseph et al., 2024).

Table 2. Identification of weeds in the sugarcane highland field

No	Species	Local Name	Potential and Benefits
1.	*Mimosa pudica* L. (Broadleaf)	Putri Malu (Sensitive plant)	Traditional medicine, cover crop, and pesticide
2.	*Amaranthus tricolor* L. (Broadleaf)	Bayam (Edible amaranth)	Food and traditional medicine
3.	*Ipomoea obscura* (Broadleaf)	Bunga Pagi (Obscure morning glory)	Traditional medicine
4.	*Guizotia abyssinica (*L.f.) *Cass.* (Broadleaf)	Biji Niger (Niger plant)	Traditional medicine and bird food
5.	*Chromolaena odorata* (Broadleaf)	Kirinyuh (Siam weed)	Traditional medicine, organic fertilizer, and pesticide
6.	*Eleusine indica* (Narrowleaf)	Rumput Belulang (Indian Goosegrass)	Traditional medicine and livestock feed
7.	*Cyperus rotundus* (Narrowleaf)	Rumput Teki (Nutgrass)	Traditional medicine, source of essential oil, and insectiside
8.	*Cayratia trifolia* (Broadleaf)	Daun Galing (Fox grape)	Traditional medicine
9.	*Modiola caroliniana* (Broadleaf)	Modiola (Carolina bristlemallow)	Food and traditional medicine
10.	*Digitaria sanguinalis* (Narrowleaf)	Rumput Jariji (Crabgrass)	Traditional medicine and live stock feed
11.	*Montanoa bibiscifolia* Benth. (Broadleaf)	Jamras Bunga Putih (Bush daisy)	Traditional medicine and ornamental plant

Portulaca olecacea contains diverse metabolites such as alkaloids, catecholamines, phenolic acids, flavonoids, anthocyanins, homoisoflavonoids, lignans, terpenoids, fatty acids, betalains, and many other phytoconstituents (Kumar et al., 2022). The most recent discovery is that *P. oleracea* contains polysaccharide (POP), a prominent active constituent, because of its non-toxicity, high abundance, and numerous documented positive pharmacological actions. POP has received a lot of interest in recent decades, especially for its role in essential biological processes such as anticancer, antibacterial, immunomodulatory, anti-inflammatory, and intestinal microbiota modification (Chen et al., 2024).

Cleome rutidosperma contains analgesic, antipyretic, anti-inflammatory, antioxidant, antiarthritic, anthelmintic, antibacterial, laxative, and diuretic (Khuntia et al., 2021). Cleome extracts have been used to cure various illnesses, including fever, cough, snake bites, nephritis, diarrhea, bronchitis, malarial fever, liver abnormalities, and skin diseases (Chi & Hop, 2002; Nnadozie et al., 2023). Its use in traditional medicine has shown that activity such as exhibits anti-inflammatory, antinociceptive, antioxidant, anti-tumor, and antimicrobial activities (Nguyen, 2023). The wound healing efficacy of *C. rutidosperma* roots was improved by the addition of water, chloroform, methanol, and petroleum ether extracts (Mondal & Suresh, 2012; Khuntia et al., 2021).

Digitaria ciliaris leaf extract contains complex compounds like Pregna-6,16-diene-11,20-diol and β-N-Acetylneuraminic acid derivatives that show potential for hormonal, anti-inflammatory, antiviral, and immune-modulating properties. The extract's medicinal potential is enhanced by compounds such as α-D-Glucofuranose and Phenol, 2,5-bis (1,1-dimethylethyl). These compounds play distinct biochemical roles (Warghat et al., 2024). *D. ciliaris* flower specifically contains 15 compounds, which may indicate improved skin wound healing and regeneration by promoting fibroblast proliferation, migration, and collagen synthesis, as well as keratinocyte proliferation (Soo et al., 2020).

Amaranthus viridis contains quercetin, kaempferol, myricetin, gallic acid, vanillic acid, syringic acid, p-coumaric acid, ferulic acid, isoquercetin, rutin, vitexin, etc (Anubhav et al., 2020; Raj et al., 2021; Kumar et

al., 2022). All parts of *Amaranthus viridis* are useful for treating various diseases, such as against inflammation and dysentery. Specifically, the root part has potential for treating irritation during constipation and urination (Duke et al., 1985; Standley et al., 1917; Stevens et al., 2001; Khan et al., 2011; Kumar et al., 2022). Traditional applications include treating asthma, respiratory problems, sexually transmitted diseases, and urinary tract irritation (Bharathi et al., 2022).

Phyllanthus niruri Linn. has the potential to contain medical compounds, particularly in leaves that contain high amounts of phenolic, oxalate, and phytate (Olufayo et al., 2021). It is also known to have anti-inflammatory, hypoglycemic, antiviral, antioxidant, hepatoprotective, and anti-calculus formation properties (Lee et al., 2016; Kumar et al., 2023).

Eleusine indica contain phenolic compounds, alkaloids, flavonoids, steroids, coumarins, fatty acids, essential oils, and many other chemical substances. Traditionally used by decoctions for anti-helminthic and febrifuge therapies. Besides that, the plant is widely used to deworm, treat coughs and lung infections, diarrhea, heart attacks and high blood pressure, spleen and liver disorders, blood and kidney stones, bone dislocations, and lumbago (Kashyap et al., 2023).

Trianthema portulacastrum is widely used as a vegetable and source of carbohydrates, protein, and minerals (Khan et al., 2013; Das et al., 2020). It contains numerous therapeutically beneficial bioactive elements such as flavonoids, saponins, alkaloids, steroids, terpenoids, tannins, glycosides, and phenols. This plant has various pharmacological properties, including antioxidant, antibacterial, anti-inflammatory, analgesic, antifungal, antipyretic, anticancer, hypoglycemic, and hepatoprotective (Hasanpuri et al., 2024).

Some research findings from the summary on Idoudi et al. (2024) article review found that *Polygonum aviculare* produces potential metabolite properties for medicine, namely phenolic acid, caffeic acid, ferulic acid, gallic acid, chlorogenic acid, p-coumaric acid, protocatechuic acid, catechin, epicatechin, quercitrin, kaempferol, myricetin, and polydatin in leaves, aside that quinic acid in the stem.

That chemical compound participates in antioxidant, anti-inflammatory, anti-diabetic, anti-cancer, and dermatologically protective activity (Benrahou et al., 2023). This species is traditionally used to treat kidney stones, hemostasis, hyperglycemia, and digestive disorders (Idoudi et al., 2024).

Crassocephalum crepidioides contains several active chemicals, such as polyphenols, flavonoids, quinones, tannins, monoterpenes, sesquiterpenes, triterpenoids, and steroids (Adjatin et al., 2013; Widayanti et al., 2020). *C. crepidioides* has activity on antioxidant, hypoglycemic, and anti-inflammatory (Can & Thao, 2020; Abdon et al., 2024). Its leaves and stems are for food components like soups and treat disorders such as indigestion, stomach pain, epilepsy, headache, and wounds (Sakpere et al., 2013; Falowo et al., 2023).

Mimosa pudica L. has a wide range of pharmacological actions, including antioxidant, antibacterial, antifungal, anti-inflammatory, hepatoprotective, anticonvulsant, depressive, diuretic, antiparasitic, and antimalarial. It has essential secondary metabolites, such as alkaloids, mimosine, tannins, steroids, flavonoids, triterpenes, and glycosyl flavones (Ahmad et al., 2012; Ananda et al., 2024). Traditional medicine uses its potential to treat a variety of illnesses, by decoction treats dysentery, leprosy, piles, urinary issues, skin illnesses, leukoderma, and jaundice (Joseph et al., 2013; Adurosakin et al., 2023).

Ipomoea obscura contains indole alkaloids such as Ipobscurine A, Ipobscurine B, Ipobscurine C, and Ipobscurine D, as well as tropane alkaloid Calysteginine B-1, 2, 3, and 4. Calisteginine C-1 (Asano et al., 2001, Eich et al., 1986; Shinde et al., 2022). It has laxative, psychedelic, anticarcinogenic, hepatoprotective, oxytocin, and antioxidant effects (Vaidya et al., 2013, Hamsa, et al., 2011; Agase et al., 2024). Traditionally, it is used usually to treat liver diseases (Desale et al., 2020).

Tannins, terpenoids, alkaloids, flavonoids, cardiac glycosides, and steroids were found in an ethanolic extract of *Guizotia abyssinica (*L.f.) *Cass* seeds (Balakrishnan et al., 2010, Dwivedi et al., 2013, Dwivedi et al., 2013; Shashikala et al., 2023). Folk-lore uses the seeds as a poultice on the skin to treat pain, itching, swelling, inflammation, abscesses, and boils. There are reports that seed oil can be used to treat syphilis and for birth control (Sumeet et al., 2012, DA&FW of India, 2014; Shashikala et al., 2023).

Eleusine indica contains medicinal phytochemicals such as flavonoids, steroids, essential oils, cardiac glycosides, coumarins, fatty acids, anthraquinones, anthrones, triterpenes, tannins, and alkaloids (Zakri et al., 2021). Pharmacological studies have shown this plant exhibits a comprehensive array of biological properties, including antioxidant, antibacterial, cytotoxic, antidiabetic, antiplasmodial, hepatoprotective, antihypertensive, anticonvulsant, antileishmanial, analgesic, antipyretic, and antitrypanosomal activities (Al-Zubairi et al., 2011, De Melo et al., 2005, Lim, 2016, Tutor et al., 2018, Ettebong et al., 2020; Zakri et al., 2021).

Cyperus sp. contains bioactive chemicals such as α-cyperone, α-corymbolol, α-pinene, caryophyllene oxide, cyperotundone, germacrene D, mustakone, and zierone, which give the extract pharmacological effects (Taheri et al., 2021). Recent phytochemical studies on *C. rotundus* have identified a variety of secondary metabolites, including sesquiterpenes, flavonoids, iridoids, phenylpropanoids, furochromones,

phenolic acids, alkaloids, steroids, and saponins (Elshamy et al., 2020, Bezerra et al., 2022, Park et al., 2019, Sayed et al., 2007; El-Wakil et al., 2023). Several countries use *Cyperus* rhizomes and tubers to cure fever, digestive ailments, and menstrual abnormalities (Srivastava et al., 2013, Dan et al., 2011; Taheri et al., 2021).

According to early phytochemical screening, the entire *Cayratia trifolia* plant contains yellow waxy oil, steroids, terpenoids, flavonoids, and tannins. Besides that *C. trifolia* leaves include stilbenes, piceid, reveratrol, viniferin, and ampelopsin specifically (Perumal et al., 2016; Meganathan & Panagal, 2023). The plant extract has been shown to have antibacterial, antioxidant, antiviral, antiprotozoal, and hypoglycemic properties (Perumal et al., 2015; Sowmya et al., 2021). It has been shown and employed in wound healing, antimicrobial, and diuretic therapy in indigenous use (Kumar et al., Nguyen et al., 2024).

Digitaria sanguinalis has veratric acid, maltol and loliolide (Zhou et al., 2013; Kumar et al., 2021). Veratric acid has various bioactivities, including anti-inflammatory and anti-fungal properties. Maltol is commonly used as a food additive as a bidentate metal-ligand for administered medications (Lee et al., 2010; Kumar et al., 2021). Loliolide has many bioactivities, including antimicrobial, antifeedant, and herbicidal properties (Colom et al., 2007; Kumar et al., 2021).

Aerial parts of *Montanoa hibiscifolia* Benth. contains metabolite Sesquiterpene. *M. hibiscifolia* Benth. also has bioactive substances like terpenoids, particularly diterpenoids, tannins, saponins, and flavonoids that may inhibit fungi such as *Candida albicans* (Villa et al, 2014, Braca et al., 2001, Muller et al., 2004; Fardiansyah et al., 2020).

b. Biological agencies

Wild plants can serve as biological agents. Plant components can used as insecticides, herbicides, and elicitors. In the lowland can be found *Ageratum conyzoides* and *Cyperus rotundus* L., and in the highland can be found *Mimosa pudica* L. and *Chromolaena odorata* as potential biological agencies.

An elicitor is a substance or factor that causes a defensive response in plants. The found signaling molecules or chemical elicitors, as well as their role in plant and other organism interactions, have fascinating implications and uses in both natural and controlled environments (Kong et al., 2019). *Ageratum conyzoides* Linn. provides an elicitor for another plant. According to Valdes (2016); Elimasni (2024), these weeds contain useful chemical components such as terpenoids, phenols, and flavonoids that work as natural defenses against infections and growth regulators.

A. conyzoides Linn. contains secondary metabolites such as phenols, glycosides, and resins. It also has insecticidal, feeding deterrent, and repelling properties against common agricultural pests (Bosi, et al., 2013, Liu & Liu, 2014; Vasantharani et al., 2023). *Cyperus rotundus* L. contains several steroids, triterpenes, tannins, anthraquinones, and alkaloids (Kempraj and Bhat, 2008; Geoge et al., 2023). Tuber has potential against pests such as antiparasitic and insecticidal repellent (Singh et al., 2009; Singh, 2023). Research also indicates that *C. rotundus* oil is more effective than carbamate and organophosphate insecticides against aphids, ants, and flies (Bañez & Castor, 2011; Geoge et al., 2023)

Mimosa pudica L. has potential as a pesticide since it contains protein, steroid, triterpenoid, sterol, polyphenol, flavonoid, alkaloid, tannin, mimosin component, and piperyloyl quinic acid ((Kalabharathi, 2015; Rajendran & Krishnakumar; 2010; Ranjan, 2013; Wowor et al., 2022). According to Ahmad et al. (2022) research paper, *Chromolaena odorata* contains an alkaloid (pyrrolizidine alkaloids) (Moder, 2002; Haryati et al., 2004; Fitriana et al, 2012), phenolic compounds, triterpenoids, tannins, flavonoid eupatorin, and limonene (Romdonawati 2009; Fitriana, 2013;). *Chromolaena odorata* has the potential to control nematodes (*Meloidogyne incognita*) (Thoden et al., 2007), *Spodoptera litura* (Utami, 2003), *Spodoptera exigua* (Haryati et al., 2004), *Sitophilus zeamais* (Bouda et al., 2001), *Sitophilus oryzae*, *Tribolium castaneum* (Owusu, 2001), and *Simulium* sp. (Matur & Davou, 2007).

c. Livestock and bird feed

From the lowland, there are several weeds such as *Digitaria sanguinialis, Amaranthus viridis,* and *Brachiaria mutica.* Whereas found in the highland are *Guizotia abyssinica (*L.f.) *Cass., Eleusine indica,* and *Digitaria sanguinalis*. *Digitaria sanguinalis* are used as cattle pastures (Pitman et al., 2016; Weinert-Nelson et al., 2022; Minoji & Sakai, 2024). *Amaranthus viridis* has been utilized in many nations as a grain, fodder, or silage crop for animals such as cattle, chickens, pigs, and rabbits (Peiretti, 2018). *Brachiaria mutica* is a spreading grass with stolons that tolerates both dry and wet growing conditions. That is why it is appropriate to plant as a fodder crop under coconut trees (Reynold, 2022, Andrade & Ferguson, 2023; Rumokoy & Toar, 2014).

*Guizotia abyssinica (*L.f.) *Cass.* is one of the primary substances in bird feed. The press cake from oil extraction is utilized as livestock feed (Ranganatha, 2013). *Eleusine indica* can be a productive feed, supplying

up to 30 t/ha of fresh matter, and it can be consumed by cattle during the early stages of growth ((Ecocrop, 2019; FAO, 2017; Heuzé et al., 2019).

d. Soil conservation

In the lowland, several weed species are *Portulaca oleracea,* and *Polygonum aviculare.* On the other hand, in highland found *Mimosa pudica* L. *Portulaca oleracea* has long-term sustainability of farming systems, particularly soil quality management, which is a growing problem. Sustainable agriculture practices have been shown to improve soil organic matter and water retention capacity. These practices enhance soil structure and permeability and reduce nitrogen leaching compared to traditional agricultural methods (Gomiero et al., 2011; Carrascosa et al., 2023). *Polygonum aviculare* has been suggested as a cover plant for extensively trodden regions since it is tolerant to trampling and soil compaction; also, it has been shown to have some salt tolerance (Foderaro and Ungar, 1997; CABI, 2021). *Mimosa pudica* L. develops a dense ground cover that limits the growth and reproduction of native plants by blocking sunlight and preventing seeds from reaching the soil (Lucci, 2012; Shivani et al., 2024).

e. Other benefits

Portulaca oleracea contains a substantial quantity of omega-3 fatty acids, which are not commonly found in vegetarian diets, indicating its potential as a functional food (Palaniswamy, 2001; Kumar et al., 2021). In Ethiopia, *Guizotia abyssinica* (L.f.) Cass. used to produce oil, a paste known as 'litlit', and a paste mixed with a snack, which is usually provided to a large family to suppress appetite during the extra meal hour. The seed paste is blended with other roasted cereals or spread to flatbread or 'injera' for special occasions, particularly in Northern Ethiopia. The flour or meal from the oil press is also used to smooth the heated baking clay pan before baking as 'masesha' (DA&FW of India, 2014; Shashikala et al., 2023). Besides that, oil can be used in the cosmetics business. Due to its low cost, seed oil is frequently used as a substitute or adulterant for other oils. Semi-drying oil is used in limited quantities as paint oil (Sastri, 2009; Shashikala et al., 2023). There was a considerable requirement for *Cyperus rotundus* oil in treating laser-induced erythema and inflammation. This helped lower tissue swelling and seeping of fluids associated with inflammation, revealing a good healing profile (Mohammed, 2022). *Montanoa hibiscifolia* Benth. has gorgeous white flowers and foliage that serve as ornaments (Udhayavani & Ramachandran, 2017).

Conclusion

The most potential of weeds in sugarcane, both lowland and highland are for medicines. 10 from 13 species in lowland are useful for medicine are *Ageratum conyzoides, Portulaca oleracea, Digitaria ciliaris, Phyllanthus niruri* Linn.*, Eleusine indica, Trianthema portulacastrum, and Crassocephalum crepidioides. Meanwhile, from the highland can be found Mimosa pudica* L.*, Cyperus rotundus, Cayratia trifolia, and Montanoa hibiscifolia Benth*. All of the 11 weeds in highland have potential for medicine are *Mimosa pudica* L.*, Amaranthus tricolor L., Ipomoea obscura, Guizotia abyssinica* (L.f.) Cass., *Chromolaena odorata, Eleusine indica, Cyperus rotundus, Cayratia trifolia, Modiola caroliniana, Digitaria sanguinalis, Montanoa hibiscifolia* Benth. Other weeds have benefits for biological agencies, livestock and bird feed, soil conservation, food, oil sources, and ornamental plants. This provides an opportunity to create various new products in the future for achieving the goals of Zero Hunger and Good Health and Well-Being.

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