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Research article

EFFECT OF LEAF EXTRACT AND LEAF MULCH OF SELECTED AGRO FORESTRY SPECIES ON GROWTH AND YIELD OF MAIZE (ZEA MAYS L)

[1] **Adesokan F.B, Oyewumi R.V[2], Odetola E.F[3], Ogunade J.O[4], Onifade A.O[5], Oni O.A[6], Omoayena E.J[7], Majolagbe M.O[8]**

[1245678]Forestry Research Institute of Nigeria, Jericho Hill Ibadan Oyo State, [3]Adekunle Ajasin University, Akungba Akoko, Ondo State, Nigeria

E-mail:sokanbola16@gmail.com

ABSTRACT

This field research was conducted to evaluate the effect (inhibitory or stimulatory potential) of leaf extract and mulch of selected agroforestry tree species (*Treculiaafricana, Enterolobiumcyclocarpum and Leuceanaleucocephala)* on the growth and yield of Maize (*Zea mays*). The extract rate at 0%, 8%, 16%, 24% and 32%, while Mulch rate at 0g, 20g, 40g, 60g and 80g were used as treatment on the maize. The morphological parameters (leaf production, leaf length and stem height) were collected at 2, 4 and 6 weeks after planting (WAP) and the chlorophyll content of the maize were determined at the end of the 6th week after planting. Data collected were analysed using General linear model of SAS, 1999 and the means was further separated using Duncan multiple Range test. The result showed that *Leuceanaleucocephala* contains higher allelochemicals that are inhibitory to the physiology of maize, both in the maize treated with leaf extract and leaf mulch, as the least total chlorophyll content, leaf production, leaf length and stem height was recorded in the maize treated with *Leuceanaleucocephala* (2.06±0.02), (4.31±0.23), (19.36±0.39) and (35.22±0.91) respectively, under leaf extract treatment. The same trend was observed in the leaf mulch treatment. *Treculiaafricana* was observed to have stimulatory effect on the yield and growth of maize. Furthermore, it also showed that in terms of duration, the inhibitory effect was more pronounced at two weeks after application of leaf extract and leaf mulch than at six weeks. Also, the results also showed that the leaf mulch of the selected agroforestry tree species have more allelopathic effect than the leaf extract, phytotoxicity was high in the leaf mulch, compared to the leaf extract. It is evident from the result that the severity and persistence of the inhibitory effect of the extract and mulch respectively are in the order Leuceana>Enterolobium>Treculia. Finally, it is established that the increase in allelochemicals toxicity was increasing with increase in extract and mulch rate.

Keywords: effect, leaf extract, leaf mulch, agro forestry, maize.

I. INTRODUCTION

In recent studies, it has been observed that woody perennials release some Phytochemicals into the soil, which adversely affect the germination and yield of under storey crops (Singh & Uman, 2015). Cipollini *et al.*, (2012) stated that beneficial or harmful effects of one plant on another plant due to release of phytochemocals, known as allelochemicals, from plant parts by leaching, root exudation, volatilization, residue decomposition, and other processes in both natural and agricultural systems is termed as allelopathy. As seen in Singh, *et al.*, (2006), allelopatic interactions in tree crops association in agroforestry greatly influences crop production. However when the trees and crops grow together, they interact with each other either inhibiting or stimulating their growth or yield through direct or indirect allelopatic interactions.

Kohli, Singh, & Batish, (2008) reported that Allelopatic compounds produced by higher plants are mostly secondary metabolites, Phenolics, cyanogenic glycosides, quinones, lactones, organic acids and volatile terpenes which are released into the neighbouring environment through different plant parts as stated earlier.

Allelochemicals decrease stomatal conductance by inducing ABA (Abscisic acid) production, which indirectly impacts on the rates of photosynthesis and transpiration which decreases respiration and uncoupling oxidative phosphorylation (Li, Jia, & Li, 2007). Multiple physiological effects have commonly been observed from treatments with many phenolics. These effects include reduction in plant growth, absorption of water and mineral nutrients, ion uptake, leaf water potential, shoot turgor pressure, physiological drought and osmotic potential (Álvarez *et al.*, 2012), and are attributed to inhibitory effects on germination and growth. Addition or incorporation of plant residues into the growth environment of another plant can result in germination and growth inhibition (Rezaeinodehi *et al.*, 2006)

Agro forestry is being practiced in a variety of climatic conditions to achieve one or more goals, and thus needs a classification. Some of the commonly employed criteria for categorization are based on array of different components of the system (spatial/temporal), relative importance and role of various components, production aims, and social/economic features. On the basis of components, it is mainly divided into agriculture (crops-trees-shrubs-vines), silvopastoral (pasture-animals trees), and agrisilviculture (crops-pastureanimals-aquaculture-sericulture-apiculture-trees). Based on the space arrangement, it can be divided into mixed dense, mixed sparse, support tree, etc. When classified from the viewpoint of protection, agroforestry is divided into soil conservation, moisture conservation, shelterbelts, and windbreaks. However, when the emphasis is on production, it is divided into food, fodder and timber. Recently, attention has been paid to the possible allelopathic interactions between different components of the agroforestry system to make it more productive and sustainable (Szigeti, Frank, & Vityi, 2020).

To optimize the gains of agroforestry, several standard management practices have been evolved and selection of suitable agroforestry species (AF species) is one of those. Any such selection is based on a number of important characters of AF species, such as fast growth rate, thorough passage for sunlight to the ground, rooting pattern, and multi purposeness of AF species. It is surprising that allelopathic properties of AF species so far have not been paid enough attention, though a lot of research has been done in this area, but the surface has only been scratched. Detailed information about the allelopathic effects of AF species on other components (annual plants) of agroforestry systems is limited.

If available, such information would prove useful to identify ‘allelopathically compatible’ AF species (having either beneficial or at least no adverse effect on companion crop) or ‘non compatible’ ones with inhibitory effects. This kind of knowledge would greatly facilitate formulation of agroforestry systems with higher yields by avoiding harmful allelopathic interactions and through exploitation of beneficial effects of particular AF species.

Therefore, Allelopathic interactions of three selected agroforestry trees on Maize (Zea mays) will be tested, to formulate a sustainable Agro forestry system.

Understanding the allelopathic interactions between these selected agro forestry species; *Treculiaafricana*(Decne.), *Leucaenaleucocephala* (Lam.), *Enterolobiumcyclocarpum* (Jacq.) and Maize *(Zea mays)* makes it easy to construct a sustainable Agroforestry system, and also to design ecologically viable land use systems for maize production, because several studies has shown that allelopathic interactions in

Agroforestry can be Inhibitory or Stimulating. Hence, this study will be able to provide answer to the unanswered question about the allelopathic interaction between the selected agroforestry trees and Maize *(Zea mays)*.

This research will also help us to optimize the potential benefit of this Agroforestry system on both the Short Run and Long run, i.e. production of Maize on the Short run without complication, and Agroforestry trees productivity on the Long run.

This studies will not only make help the land use ecologically sound but economically acceptable, and enhance the maximum productivity of maize in an Agroforestry system, because Maize popularly known as Corn, has been said to have great effect On Nigeria economic food Security, because it constitute a large percentage of Food an Average Nigerian eat daily, ranging from Pap, Roasted corn, Boiled corn, Tuwo, Corn Flakes, Corn and Beans and many more, thereby making its productivity in an Agroforestry system a vital one(Adediji & Akinjobi, 2020). However this research is carried out in line with three (3) objectives:

- To assess the growth and yield of *Zea mays* (L.) as influenced by some selected Agroforestry species plant leaf extract and leaf mulch
- Chlorophyll content of *Zea mays* (L.) after the application of the leaf extract and leaf mulch of the selected agroforestry species.
- Effects of *Treculiaafricana*(Decne.), *Leucaenaleucocephala* (Lam.), and *Enterolobiumcyclocarpum* (Jacq.) leaf extract and leaf mulch on the morphological and physiological growth of *Zea mays* (L.)

The rest of this paper is organized as follows; **Section II** discusses the existing literature on agroforestry research with focus on zea mays related works, **Section III** presents the methodology used in this research, **Section IV** presents our results, while conclusion and recommendations are presented in **Section V**.

II. LITERATURE REVIEW

Origin and General description of Maize

Maize (*Zea mays*L), as well known as corn, is a cereal grain that was initially domesticated in Mesoamerica (Agyeman, K. Afuakwa, J.J. Owusu Danquah, E and Asubonteng, 2012). Though there are many assumptions about the progenitor of maize, it is however generally accepted that maize originated from teosinte (*Zeamexicana* L) which is the closest known wild relative of maize (Abdoul-Raouf, Ju, Jianyu, & Zhizhai, 2017). This plant is similar to maize by having a monoecious flowering habit, same number of chromosomes and is readily crossed with maize (Odetola, Awopetu, Adeniyi, & Sabitu, 2020). Maize spread to the rest of the world after European contact with the Americas in the Late 15^{th} and early 16^{th} century. It has now become a principal cereal crop in the tropics and in the subtropical regions throughout the world *Zea* is a genus of the family Graminae (Poaceae), commonly known as the grass family. Maize (*Z. mays L.*) is a tall, monoecious annual grass with overlapping sheaths and broad conspicuously distichous blades. Plants have staminate spikelets in long spike-like racemes that form large spreading terminal panicles (tassels) and pistillate inflorescences in the leaf axils, in which the spikelets occur in 8 to 16 rows, approximately 30 cm long, on a thickened, almost woody axis (cob).

Importance of Maize

In some countries, such as the USA, maize is number one feed grain for animal feed because of its high conversion factor into meat, milk and eggs compared to other cereal grains. It is a valuable feed grain because it ranks highest in net energy content and lowest in protein and fiber content. Maize can be fed directly or it is milled or pounded and mixed with other ingredients (Sosan, Oyekunle, & Odewale, 2018). In addition to being eaten straight off the cob or popped, corn is used to manufacture corn syrup, a widely successful artificial sweetener. Corn is also used to synthesize a number of compounds used in manufacturing processes, such as corn starch, which is in everything from cardboard to biodegradable containers. Corn is extensively cultivated to produce animal feed, with all feedlot animals consuming pounds of the crop each day. In addition, corn is used in the manufacture of alcohol and ethanol, a commonly used alternative fuel (Eckert et al., 2018)

Phytochemical value of maize

Phytochemicals are bioactive chemical compounds naturally present in plants that provide human health benefits and have the potential for reducing the risk of major chronic diseases (Thakur, 2018). Maize is an essential source of various major phytochemicals such as carotenoids, phenolic compounds, and phytosterols (Gupta, 2019)

- ***Carotenoids***

Carotenoids belong to a family of red, orange, and yellow pigments. There is a large quantity of carotenoid pigments present in yellow maize grains, especially in horny and floury endosperm (Xu, 2019). These pigments are divided into two classes: carotenes, which are purely hydrocarbons containing no oxygen, and xanthophylls (lutein and zeaxanthin) which are hydrocarbons containing oxygen.

- ***Phenolic compounds***

Phenolic compounds are most widely distributed category of phytochemicals in the plant kingdom (Chemistry, 2019). They are specified as phenolic acids, flavonoids, stilbenes, coumarins, and tannins (Xu, 2019). These compounds are abundantly present in maize, especially in bran(Chemistry, 2019). The major phenolic compounds from maize are ferulic acid (FA) or 4-hydroxy-3-methoxycinnamic acid and anthocyanins. Refined corn bran contains the highest FA content, followed by barley and wheat (Zhao &Moghadasian, 2008).

- ***Phytosterols***

Phytosterols also called as plant sterols are the essential components of plant cell walls and membranes (Calpe-Berdiel, Escolà-Gil, & Blanco-Vaca, 2009). More than 250 different phytosterols have been found so far which are divided into three classes based on their number of methyl groups at C-4 position: simple sterols or 4-desmethylsterols, 4, 4-dimethylsterols, and 4-monomethylsterols. Maize oil is very rich in phytosterols (Harrabi et al., 2008). The most commonly consumed phytosterols from maize oil are sitosterol, stigmasterol, and campesterol.

Agroforestry, Soil Condition for Maize Production

Maize has been grown under conventional agroforestry practices in Nigeria for years. The basis of conventional tillage is annual ploughing or tilling of the soil, but this is usually supplemented with a number of other practices, including the removal or burning of crop residues, land leveling, harrowing, fertilizer application and incorporation, etc. All of these practices cause soil disturbance, compaction, and deterioration. Ploughing causes the rapid breakdown of soil organic matter. The soil collapses and compacts, reducing aeration and the number of soil organisms. The topsoil becomes susceptible to erosion and water runoff, so that after heavy rainfalls a great deal of soil is lost and little water is retained, leading to shallow and infertile soils which are no longer able to produce good yields.

Irrigation obviously increases tonnage and reassures the highest possible grain production barring any uncontrollable weather events. For example, corn silage production in North Dakota averaged 6.5 tons per acre on dry land acres compared to 14.9 tons per acre on irrigated acres in 1995. Maize can be grown on soils with pH values ranging from 5.5 to 8.0 and does best at neutral pH.

Good sprouting of this crop is at soil temperature of 20-22 °C. The optimum temperature for the growth of maize lies within 28-35 °C and the maximum temperature is 45-47 °C. Soil moisture of 60-70% field water capacity is most favorable for maize plant. The maize plants develop both in short-day and long day conditions, but a short day favors rapid growth. (Yang et al., 2020).

The soils of the major maize growing areas in Nigeria are low in organic carbon (<1.5%), total nitrogen (<0.2 %), exchangeable potassium (<100 mg/kg) and available phosphorus (< 10 ppm) (Lelago, 2016). A large proportion of the soils are also shallow with iron and manganese concretions (Karuma, 2019).

Treculiaafricana (Decne)

Treculiaafricana is a multipurpose tree species commonly known as African breadfruit. It belongs to the family Moraceae and it grows in the forest zone, particularly the coastal swamp zone (Osuntokun, Jemilaiye, Vt, & Thonda, 2018).*Treculiaafricana* is an evergreen forest tree of about 10 to 30m (50m maximum) in height and 3m in girth with a dense spreading crown and fluted trunk. The bark is grey, smooth and thick when cut, exuding white latex which later turns rusty-red on exposure to air (Osuntokun et al., 2018).

COMMON NAMES

Afon (Yoruba), barafuta (hausa), And ukwa (igbo)

ECONOMIC IMPORTANCE OF *Treculia Africana*

*Treculiaafricana*is important is because of the potential use of its seeds, leaves , timber, roots and bark and the collection of its products has great potentials of enhancing rural livelihoods and national food security (Olajuyigbe, Fadairo, Osayomi, & Alabi-adelakun, 2020). The seeds could be toasted, parboiled or raosted to ease dehauling for meal or further processing into flour which can be made into bread, pasta and baby food, the seed could also be roasted and eaten as snacks or cooked for human consumption (Kumari, Singh, Singh, Bhatia, & Nain, 2019). The fruit head pulp and bran which contain 9.4% and 5.7% protein respectively can be used for livestock feeding as well as the leaves for fodder, the wood is put into various uses including furniture making, pulp and paper production as well as fibre- board production (Lee et al., 2019). The species make good use of marginal areas where other species may not be able to grow; it helps to control erosion and also helps in soil conservation as the tree is a good source of mulch (Hussain, Farooq, Muscolo, & Rehman, 2020). The decayed trunk can be used as medium for raising mushrooms and use of stands of the species as boundary landmark due to the hardiness or resilience of the species (Hussain et al., 2020)

PEST AND DISEASES OF *Treculia Africana*

Aspergilliusflavus, Aspergillusniger, Rhizopusstolonifer and *Fusarummoniliforme* have been implicated with the fruit/seed rot of African Breadfruit. There are two primary insect pest of stored *Treculiaafricana*namel*y Treboliumcastaneum* Herbst and *sitophiluszeamais* Motsch .

Enterolobiumcyclocarpum (Jacq)

The Nitrogen fixing tree *Entrolobium cyclocarpum* belongs to the sub family Mimosoidae of the leguminosae and is placed in the tribe Ingeae. It ability to fix Nitrogen and to sprout vigorously when coppiced, suggest it could also have a role in alley-cropping systems as a Hedgrow species (Xu, 2019). *cyclocarpum* as an ornamental and pasture shade trees besides restoring the environment where the tree itself has a restorative effect on degraded land by fixing nitrogen; the atmospheric nitrogen is converted into ammonia (NH3), nitrates (NO3-163) and nitrites (NO2-) and then used as fertilizer in agriculture(Gupta, 2019). This species thus help to improve soil fertility, hold soil particles together and help to prevent erosion (Saleem et al., 2020)

ECONOMIC IMPORTANCE OF *Enterolobium cyclocarpum*

It is valuable firewood and can be used to make charcoal. The wood is highly resistant to fungi and dry-wood termites. It is used for construction and to make handcrafts, toys and utensil. It has a very low density and can make floating materials for fish nets or canoes. The flesh from the pods contains saponins and is used as a detergent to wash clothes. In the humid lowlands of Western and Central Africa, *Enterolobium cyclocarpum* could have a high potential for crop-livestock agroforestry as it yields high amounts of fodder and has valuable concentrations of protein and fibre (Adegbeye et al., 2020).

Enterolobium cyclocarpum has been used in reclamation programmes in degraded forests. It is an N-fixing tree that helps binding the soil, preserving soil moisture, thus preventing erosion (Kaledhonkar, Sharma, & Meena, 2018).

PEST AND DISEASES OF *Enterolobiumcyclocarpum*

Enterolobium cyclocarpum has no widespread or serious diseases or pest problem. Parrots often prey on the green pods, and the gall-forming moth, *Asphondylia enterolobii*, may disrupt fruiting. Occasional attack by Fusarium fungus may cause the affected limbs to fall from mature trees (Hameed, Hussain, & Suleria, 2020)

Asphondylia enterolobii, (Lam)

Geographical Distribution and Ecology

Leucaenal eucocephala is essentially a tropical species requiring warm temperatures for optimum growth and with poor cold tolerance and significantly reduced growth during cool winter months in subtropical areas. For optimal growth it is therefore limited to areas 15-25 deg. north or south of the equator. (Zhou et al., 2018) *Leucaenaleucocephala* is a native of Colombia, Costa Rica, El Salvador, Guatemala, Honduras, Mexico, Nicaragua, Panama, Spain, United States of America and exotic in Antigua and Barbuda, Australia, Bahamas, Barbados, Cambodia, Cote d'Ivoire, Cuba, Democratic Republic of Congo , Nigeria, Dominica, Dominican Republic, Eritrea, Ethiopia, Fiji, Grenada, Haiti, India, Indonesia. Jamaica, Kenya, Laos, Malaysia, Papua New Guinea, Philipines, Puerto Rico, South Africa, Sri Lanka, St Kitts and Nevis, St Lucia, St Vincent and the Grenadies, Sudan, Taiwan, Province of China , Tanzania, Thailand, Trinidad and Tobago , Uganda , Vietnam Virgin Island(US) (Kumari et al., 2019)

ECONOMIC IMPORTANCE OF *Leucaena leucocephala*

Leucaena leucocephala can be used as fodder for livestock but it can however be toxic in large quantity due to presence of mimosine (Barros-Rodríguez et al., 2012), for food as the pods , seeds and leaf tips have used as food, although mimosine toxicity makes this practice risky , supports apiculture due to the presence of flower almost throughout the year , fiber for pulp and paper, fuel wood timber , gums and resins which has been found similar to gum arabic and of potential commercial value, Tanin or dyesruff extracted from the pods , leaves and bark , other environmental uses include erosion control through aggressive taproot system, shade, Nitrogen fixing , land reclamation, soil improver through the leaves decomposing quickly , providing a rapid, short-term influx of nutrients, ornamental uses as well as boundary demarcation (Gerster-Bentaya, 2013).

PEST AND DISEASES OF *Leucaena leucocephala*

Leucaena leucocephala is susceptible to the psylid *Heteropsyllacubuna*, which has caused serious defoliation and mortality in eastern Africa. A Caribbean parasitoid, Psyllaephagus, shows specificity and excellent appetite for *H. cubuna* and hence offers possibilities for biological control. Some varieties are susceptible to gummosis, most likely caused by *Fusarium semitectum. Ganoderma lucidum* causes root rot in arid and semi-arid regions. Leaf-spot fungus also can cause defoliation under wet conditions. Wild animals avidly consume seedlings

III. METHODOLOGY

The experiment was carried out at the forest nursery in the Federal University of Agriculture, Abeokuta. The nursery is located in the university permanent site about 50m from the main gate. The university area falls within the latitude 7.230938 N and longitude 3̊.438232. It is located in the tropical rainforest zone of Nigeria. The site has a gentle undulating landscape and mild slope. The soils are sandy loam and clay loam with crystalline baseline components with an annual rainfall of 1200mm with its peak in June and July. The relative humidity of the area is 82.54% and an average monthly temperature of 35.8℃.

Nursery Preparation

- The soil was filled into the polypots, at a weight of one kilogram (1kg) per polypot.
- The leaves extract was extracted from the collected leaves of *Treculiaafricana*(Decne.), *Leucaenaleucocephala* (Lam.), and *Enterolobiumcyclocarpum* (Jacq.), which was collected from the mother tree in FUNAAB, and made ready.
- The seeds were sown into the polypots, which contains the top soil which was collected from the forest nursery, and it was treated with the leaf extracts of the selected agro forestry trees for two days, and watering was carried out once daily for eight weeks and data's were collected at two weeks interval, i.e. two weeks after planting, four weeks after planting and six weeks after planting.

Experimental Design

The effect of leaf extracts and leaf mulch of *Treculiaafricana*(Decne.), *Leucaenaleucocephala* (Lam.) and *Enterolobiumcyclocarpum* (Jacq.) on the growth of Zea mays (L.) seedlings was studied using a randomized complete block design (RCBD)

Experimental layout

TREATMENTS	REPLICATE 1 (R1)	REPLICATE 2 (R2)	REPLICATE 3 (R3)
TA_O	TA_O R1	TA_O R2	TA_O R3
TA_{20g}	TA_{20g} R1	TA_{20g} R2	TA_{20g} R3
TA_{40g}	TA_{40g} R1	TA_{40g} R2	TA_{40g} R3
TA_{60g}	TA_{60g} R1	TA_{60g} R2	TA_{60g} R3

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TA_{80g}	TA_{80g} R1	TA_{80g} R2	TA_{80g} R3

LL_{0g}	LL_{0g} R1	LL_{0g} R2	LL_{0g} R3
LL_{20g}	LL_{20g} R1	LL_{20g} R2	LL_{20g} R3
LL_{40g}	LL_{40g} R1	LL_{40g} R2	LL_{40g} R3
LL_{60g}	LL_{60g} R1	LL_{60g} R2	LL_{60g} R3
LL_{80g}	LL_{80g} R1	LL_{80g} R2	LL_{80g} R3
EC_{0g}	EC_{0g} R1	EC_{0g} R2	EC_{0g} R3
EC_{20g}	EC_{20g} R1	EC_{20g} R2	EC_{20g} R3
EC_{40g}	EC_{40g} R1	EC_{40g} R2	EC_{40g} R3
EC_{60g}	EC_{60g} R1	EC_{60g} R2	EC_{60g} R3
EC_{80g}	EC_{80g} R1	EC_{80g} R2	EC_{80g} R3

TREATMENTS	REPLICATE 1 (R1)	REPLICATE 2 (R2)	REPLICATE 3 (R3)
$TA_{0\%}$	$TA_{0\%}$ R1	$TA_{0\%}$ R2	$TA_{0\%}$ R3
$TA_{8\%}$	$TA_{8\%}$ R1	$TA_{8\%}$ R2	$TA_{8\%}$ R3
$TA_{16\%}$	$TA_{16\%}$ R1	$TA_{16\%}$R2	$TA_{16\%}$ R3
$TA_{24\%}$	$TA_{24\%}$ R1	$TA_{24\%}$ R2	$TA_{24\%}$ R3
$TA_{32\%}$	$TA_{32\%}$ R1	$TA_{32\%}$ R2	$TA_{32\%}$R3

$LL_{0\%}$	$LL_{0\%}$ R1	$LL_{0\%}$ R2	$LL_{0\%}$ R3
$LL_{8\%}$	$LL_{8\%}$ R1	$LL_{8\%}$ R2	$LL_{8\%}$ R3
$LL_{16\%}$	$LL_{16\%}$ R1	$LL_{16\%}$ R2	$LL_{16\%}$ R3
$LL_{24\%}$	$LL_{24\%}$ R1	$LL_{24\%}$ R2	$LL_{24\%}$ R3
$LL_{32\%}$	$LL_{32\%}$ R1	$LL_{32\%}$ R2	$LL_{32\%}$ R3
$EC_{0\%}$	$EC_{0\%}$ R1	$EC_{0\%}$ R2	$EC_{0\%}$ R3
$EC_{8\%}$	$EC_{8\%}$ R1	$EC_{8\%}$ R2	$EC_{8\%}$ R3
$EC_{16\%}$	$EC_{16\%}$R1	$EC_{16\%}$ R2	$EC_{16\%}$ R3
$EC_{24\%}$	$EC_{24\%}$ R1	$EC_{24\%}$ R2	$EC_{24\%}$ R3
$EC_{32\%}$	$EC_{32\%}$ R1	$EC_{32\%}$ R2	$EC_{32\%}$ R3

WHERE;

TA_{0g} Control
TA_{20g} 20g of dried crushed leaf of *Treculiaafricana* + 1kg top soil
TA_{40g} 40g of dried crushed leaf of *Treculiaafricana* + 1kg top soil
TA_{60g} 60g of dried crushed leaf of *Treculiaafricana* + 1kg top soil
TA_{80g} 80g of dried crushed leaf of *Treculiaafricana* + 1kg top soil
LL_{0g} Control
LL_{20g} 20g of dried crushed leaf of *Leucaenaleucocephala* +1kg top soil
LL_{40g} 40g of dried crushed leaf of *Leucaenaleucocephala* +1kg top soil
LL_{60g} 60g of dried crushed leaf of *Leucaenaleucocephala* +1kg top soil
LL_{80g} 80g of dried crushed leaf of *Leucaenaleucocephala* +1kg top soil
EC_{0g} Control
EC_{20g} 20g of dried crushed leaf of *Enterolobiumcyclocarpum* + 1kg top soil
EC_{40g} 40g of dried crushed leaf of *Enterolobiumcyclocarpum* + 1kg top soil
EC_{60g} 60g of dried crushed leaf of *Enterolobiumcyclocarpum* + 1kg top soil
EC_{80g} 80g of dried crushed leaf of *Enterolobiumcyclocarpum* + 1kg top soil
$TA_{0\%}$ Control
$TA_{8\%}$ 8% concentrations of *Treculiaafricana* leaf extract + 1kg top soil
$TA_{16\%}$ 16% concentrations of *Treculiaafricana* leaf extract + 1kg top soil
$TA_{24\%}$ 24% concentrations of *Treculiaafricana* leaf extract + 1kg top soil
$TA_{32\%}$ 32% concentrations of *Treculiaafricana* leaf extract + 1kg top soil
$LL_{0\%}$ Control
$LL_{8\%}$ 8% concentrations of *Leucaenaleucocephala* leaf extract +1kg top soil

$LL_{16\%}$	16% concentrations of *Leucaenaleucocephala* leaf extract +1kg top soil
$LL_{24\%}$	24% concentrations of *Leucaenaleucocephala* leaf extract +1kg top soil
$LL_{32\%}$	32% concentrations of *Leucaenaleucocephala* leaf extract +1kg top soil
$EC_{0\%}$	Control
$EC_{8\%}$	8% concentrations of *Enterolobiumcyclocarpum* leaf extract + 1kg top soil
$EC_{16\%}$	16% concentrations of *Enterolobiumcyclocarpum* leaf extract + 1kg top soil
$EC_{24\%}$	24% concentrations of *Enterolobiumcyclocarpum* leaf extract + 1kg top soil
$EC_{32\%}$	32% concentrations of *Enterolobiumcyclocarpum* leaf extract + 1kg top soil

Procedures for experiment

This experiment was conducted for the main objective of evaluating the effect of Dried crush leaf and different concentrations of leaf extract of selected Agroforestry species "*Treculiaafricana*(Decne.), *Leucaenaleucocephala* (Lam.), and *Enterolobiumcyclocarpum* (Jacq.)" on the seedling growth of Maize in the potting medium. Maize (Zea mays L.) was planted in the polypots filled with the topsoil taken from the experimental site. Fifteen (15) seeds of maize were sown per pots and watered daily. After two weeks of growth, the plants was thinned to six (6) per pot, by removing the weak plants. The leaf extracts applied was obtained from the leaves of the selected agroforestry tree species, which was extracted, by leaving the leaves without water for a day, before extractions of various concentrations at different percentages (0%, 8%, 16%, 24% and 32%) prepared by decaying 0, 20g, 40g, 60g and 80g of Crushed leaves respectively, the percentage of the leaf extract was gotten by dividing the decaying weight by 250, and further multiplied by 100%. The 250 used here signifies the 250ml water added to the leaf, while extracting the leaf extract. This extracts was applied at a single dose of 250ml of extract per pot, and also with 250ml distilled water was used as control. These treatments were replicated three times and arranged in a randomized complete block design (RCBD). This treatment was administered for two days, after which the plant was nurtured with water daily for eight (8) weeks.

On the other hand, the dried crushed leaves of the three selected agroforestry species was applied to the pots containing the maize as mulch in a separate experiment, at the rate of 0g, 20g, 40g, 60g and 80g per pot, with the 0g serving as control. This pot was replicated three times as well and arranged in a Randomized complete Block Design (RCBD), and watered once daily for eight weeks.

Data collection

Data was collected every two weeks for eight weeks and the following parameters were recorded in the seedling. These include:

Morphological parameters

- Number of leaves were counted and recorded for each data collection day
- Plant height was measured using a meter rule which will be calibrated in millimetres(mm)
- Leaf length was measured and recorded for each data collection day.

Physiological parameters

- Chlorophyll content (after the eighth week).

Laboratory procedure for chlorophyll content analysis

The samples of leaves was collected from each treatment and prepared to determine their chlorophyll content. The extract gotten was then put into test for chlorophyll content using the spectrophotometer. Before putting the extract into the spectrophotometer, 80% methanol was used to blank the meter after which the extract was introduced into the spectrophotometer. The reading from the meter was used to the chlorophyll concentration using the following equations formulated by Arnon in Mackinney's work;

$Ca= 12.7A_{663}- 2.69A_{645}$……………………….ii

$Cb= 22.9A_{645}-4.68A_{663}$……………………….iii

D645 = Absorbance at 645nm (chlorophyll a)

D663 = Absorbance at 663nm (chlorophyll b)

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Mathematically,

Chlorophyll content= $\frac{\square\square\square\square\square\square\square\square\square\ \square\square\ 652}{24.5} \times \frac{\square}{1000} \times W$

Absorbent at 652= Optical density reading of chlorophyll

W= Fresh weight in grams of the leaf tissue extracted

V= 20ml(Value of acetone-chlorophyll extract)

Statistical analysis

- The data collected from this experiment was subjected to Two-ways analysis of variance procedure on the General Linear Model of SAS software, and the means was further separated using Duncan's multiple range test (DMRT)

IV. RESULT

Effects of extract from leaves of selected tree species on chlorophyll content of *Zea mays* in potting medium

Table 1 shows the result of chlorophyll content in the maize treated. There was a significant difference in the chlorophyll A content among the leaf extract treatments TA (1.136 ± 0.01^{a}), EC (1.09 ± 0.01^{b}) and LL (1.05 ± 0.01^{c}).The highest Chlorophyll A content (1.136 ± 0.01^{a}) was recorded in TA, followed by (1.09 ± 0.01^{b})in EC and the least recorded in LL with chlorophyll A content of (1.05 ± 0.01^{c}).

However, there was no significant difference in chlorophyll B between TA (1.12 ± 0.01^{a}) and EC (1.11 ± 0.04^{a}), but they are significantly different from LL (1.00 ± 0.01^{b}). The highest chlorophyll B (1.12 ± 0.01^{a}) was recorded in TA, the least chlorophyll B content (1.00 ± 0.01^{b}) in LL and chlorophyll B content (1.11 ± 0.04^{a}) was recorded in EC

Finally, there was no significant difference between TA (2.25 ± 0.01^{a}) and EC (2.19 ± 0.04^{a}), however, they are significantly different from LL (2.06 ± 0.02^{b}). The highest total chlorophyll was recorded in TA with a total chlorophyll content of (2.25 ± 0.01^{a}), and the least in LL (2.06 ± 0.02^{b}).

Table 1: Showing the effects of extract from leaves of selected tree species on chlorophyll content of *Zea mays* in potting medium

SPECIE	Chlorophyll A	Chlorophyll B	Total Chlorophyll
TA	1.136 ± 0.01^{a}	1.12 ± 0.01^{a}	2.25 ± 0.01^{a}
EC	1.09 ± 0.01^{b}	1.11 ± 0.04^{a}	2.19 ± 0.04^{a}
LL	1.05 ± 0.01^{c}	1.00 ± 0.01^{b}	2.06 ± 0.02^{b}

Means with the same superscripts in column are not significantly different

4.1.2. Effects of leaf extract at different percentages on the chlorophyll content of *Zea mays* in potting medium

Table 2 shows the result of chlorophyll content in the maize treated. Chlorophyll A content was not significantly different at 8% ($1.10\pm0.01a^{b}$) and 16% ($1.10\pm0.02a^{b}$) leaf extract treatment, but significantly different from other leaf extract treatments levels. The highest chlorophyll A content (1.12 ± 0.003^{a}) recorded from the maize treated with 0%(control) leaf extract and the least was recorded in the one treated with 32% leaf extract, with chlorophyll content of (1.06 ± 0.02^{c}).

However, there were no significant differences between the chlorophyll B content of the maize treated with 0% (1.08±0.01[ab]), 8% (1.08±0.02[ab]), 16% (1.06±0.02[ab]), but there is a significant difference between 24% (1.11±0.06[a]), 32% (1.02±0.02[b]) and other leaf extract levels. The highest chlorophyll B content (1.11±0.06[a]), from 24% and lowest (1.02±0.02[b]), from 32%.

Finally, there was no significant difference between total chlorophyll at 0% (2.21±0.01[a]), 8% (2.19±0.03[a]) and 24% (2.19±0.06[a]) leaf extract level. However, they are significantly different from 16% (2.16±0.03[ab]), and 32% (2.08±0.04[b]). The highest total chlorophyll content (2.21±0.01[a]), was recorded from 0% and lowest chlorophyll content (2.08±0.04[b]) from 32%.

Table 2: Effects of leaf extract at different percentages on the chlorophyll content of *Zea mays* in potting medium

TREATMENT	Chlorophyll A	Chlorophyll B	Total Chlorophyll
0	1.12±0.003[a]	1.08±0.01[ab]	2.21±0.01[a]
8	1.10±0.01a[b]	1.08±0.02[ab]	2.19±0.03[a]
16	1.10±0.02a[b]	1.06±0.02[ab]	2.16±0.03[ab]
24	1.07±0.01[bc]	1.11±0.06[a]	2.19±0.06[a]
32	1.06±0.02[c]	1.02±0.02[b]	2.08±0.04[b]

Means with the same superscripts in column are not significantly different

Effect of leaf extract at different percentages on the Growth of *Zea mays* in potting medium

Table 3 shows the result of Leaf Production (LP), Leaf length (LL) and Stem height (SH) of Maize under different level of leaf extract

There was no significant difference between the leaf productions at 8% (4.44±0.33[b]), 16% (4.52±0.36[b]), 24% (4.37±0.33[b]) and 32% (4.26±0.30[b]), but they are significantly different from 0% (4.93±0.32[a]). The highest leaf production (4.93±0.32[a]) was recorded at 0% and the lowest leaf production (4.26±0.30[b]) at 32%. Which indicates that the maize treated with water alone (control) has maximum leaf production, and the one treated with 32% has the lowest leaf production (4.26±0.30[b]).

There was no significant difference between the leaf length at 8% (36.59±1.34[b]), 16% (35.46±0.98[b]), 24% (33.88±1.37[b]) and 32% (33.85±1.24[b]), but they are all significantly different from 0% (44.63±0.88[a]). The highest leaf length (44.63±0.88[a]) was recorded at 0% and lowest leaf length (33.85±1.24[b]) at 32%.

Finally, there was no significant difference between the stem height at 8% (26.74±0.53[a]), 16% (20.37±0.67[b]), 24% (18.55±0.74[a]) and 32% (18.77±0.62[b]), but they are significantly different from 0% (22.07±0.34[a]). The highest stem height (26.74±0.53[a]) was recorded at 8%, and the lowest(18.55±0.74[a]) at 24%.

Table 3: Mean separation result for the effect of leaf extract at different percentages on the Growth of *Zea mays* in potting medium

TREATMENT (%)	Leaves production	Leaf length(CM)	Stem height(CM)
0	4.93±0.32[a]	44.63±0.88[a]	22.07±0.34[a]
8	4.44±0.33[b]	36.59±1.34[b]	26.74±0.53[b]
16	4.52±0.36[b]	35.46±0.98[b]	20.37±0.67[b]
24	4.37±0.33[b]	33.88±1.37[b]	18.55±0.74[b]
32	4.26±0.30[b]	33.85±1.24[b]	18.77±0.62[b]

Means with the same superscripts in column are not significantly different

Effects of leaf extract of the selected agroforestry species on *Zea mays* on weeks after planting (WAP).

Table 4 shows the result of Leaf production (LP), Leaf length (LL) and Stem height (SH) at weeks after planting. Irrespective of the species, there was a significant difference at different weeks after planting in leaf production. The highest LP was in 6WAP (6.55±0.10[a]) and least LP was in 2WAP (2.62±0.08[c]).

Also, similar trend was observed in leaf length (LL), there was a significant difference at different weeks after planting. The highest leaf length was in 6WAP (40.82±0.98[a]) and the lowest leaf length in 2WAP ((33.11±0.99[c]).

However, there was no significant difference in stem height at 2WAP (17.34±0.44[b]) and 4WAP (20.04±0.43[ab]) but a significant difference in LL at 6WAP (26.46±0.46[a]).

Table 4: Mean separation for the effects of leaf extract at different weeks after planting on the Growth of *Zea mays*

Weeks	Leaf Production	Leaf Length(CM)	Stem Height(CM)
2WAP	2.62±0.08[c]	33.11±0.99[c]	17.34±0.44[b]
4WAP	4.38±0.09[b]	36.73±0.95[b]	20.04±0.43[ab]
6WAP	6.55±0.10[a]	40.82±0.98[a]	26.46±0.46[a]

Means with the same superscripts in column are not significantly different

4.1.5. Effect of Selected agroforestry tree species extract (*Treculiaafricana, Enterolobiumcyclocarpium and Leucaenaleucocephala*) on the Growth of *Zea mays* in potting medium.

Table 5 shows the result of Leaf production (LP), Leaf length (LL) and Stem height (SH) of maize using leaf extract of the selected tree species. There was no significant difference in Leaf production in maize treated with TA (4.67±0.26[a]) and EC (4.53±0.28[a]), but are significantly different from the maize treated with LL (4.31±0.23[b]). The highest leaf production (4.67±0.26[a]) from TA and the least leaf production (4.31±0.23[b]) from LL.

Furthermore, there was no significant difference in leaf length (LL) of the maize treated with TA (39.07±1.23[a]) and LL (35.22±0.91[a]), but are significantly different from EC (36.38±1.02[b]). The highest leaf length (39.07±1.23[a]) from TA and the least leaf length (35.22±0.91[a]) from LL.

Finally, there was no significant difference between stem height of the maize treated by TA (23. 86±1.52[a]), EC (23. 86±1.52[a]) and LL (19.36±0.39[a]), with highest Stem height (23. 86±1.52[a]) from EC and the least Stem height (19.36±0.39[a]) from LL.

Table 5: Mean separation for the Effect of Selected agroforestry tree species leaf extract (*Treculiaafricana, Enterolobiumcyclocarpium and Leucaenaleucocephala*) on the Growth of *Zea mays* in potting medium

SPECIE	Leaf Production	Leaf Length(cm)	Stem Height(cm)
TA	4.67±0.26[a]	39.07±1.23[a]	23. 86±1.52[a]
EC	4.53±0.28[a]	36.38±1.02[b]	20.71±0.49[a]
LL	4.31±0.23[b]	35.22±0.91[a]	19.36±0.39[a]

Means with the same superscripts in column are not significantly different

Effects of leaf mulch of selected tree species on chlorophyll content of *Zea mays* in potting medium

Table 6 shows the result of chlorophyll content in the maize treated. There was a significant difference in chlorophyll A content among the leaf mulch treatments. TA (1.08±0.01[a]), EC (1.04±0.01[b]) and LL (0.95±0.01[c]).

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The highest Chlorophyll A content (1.08±0.01[a]) was recorded in TA, and the least was recorded in LL with chlorophyll A content of (0.95±0.01[c]).

However, there was a significant difference in chlorophyll B content among the leaf mulch treatments TA (1.02±0.01[a]), EC (2.01±0.04[b]) and LL (0.93±0.01[c]). The highest chlorophyll B (1.02±0.01[a]) was recorded in TA, and the least chlorophyll B content (0.93±0.01[c]) in LL.

Finally, there was a significant difference between the total chlorophyll among the leaf mulch treatments TA (2.09±0.02[a]), EC (2.01±0.04[b]) and LL (1.88±0.03[c]). The highest total chlorophyll was recorded in TA with a total chlorophyll content of 2.09±0.02[a], and the least in LL (1.88±0.03[c]).

Table 6: Mean separation result for the effects of mulch from leaves of selected tree species on chlorophyll content of *Zea mays* in potting medium

SPECIE	Chlorophyll A	Chlorophyll B	Total Chlorophyll
TA	1.08±0.01[a]	1.02±0.01[a]	2.09±0.02[a]
EC	1.04±0.01[b]	0.97±0.02[b]	2.01±0.04[b]
LL	0.95±0.01[c]	0.93±0.01[c]	1.88±0.03[c]

Means with the same superscripts in column are not significantly different

Effects of leaf mulch at different weight on the chlorophyll content of *Zea mays* in potting medium.

Table 7 shows the result of chlorophyll content in the maize treated. There was no significant difference in chlorophyll A at mulch rate 20g (1.02±0.02[ab]), 40g (1.03±0.01[ab]) and 60g (1.01±0.01[ab]), but they are significantly different from 0g (1.06±0.01[a]) and 80g (1.00±0.02[b]). The highest chlorophyll A content (1.06±0.01[a]) was recorded from the maize treated with 0gleaf mulch and the least was recorded in the one treated with 80g leaf mulch, with chlorophyll content of 1.00±0.02[b]

Furthermore,there was no significant difference in chlorophyll B at mulch rate 20g (0.97±0.01[ab]), 40g (0.96±0.02[ab]) and 60g (0.97±0.03[ab]), but they are significantly different from 0g (1.01±0.04[a]) and 80g (0.96±0.01[b]). The highest chlorophyll B content (1.01±0.04[a]), was recorded at 0g, and lowest (0.96±0.01[b]) was recorded at 80g leaf mulch.

Finally, there was no significant difference in total chlorophyll at mulch rate 20g (1.99±0.04[ab]), 40g (2.00±0.01[ab]) and 60g (1.98±0.06[ab]), but they are significantly different from 0g (2.06±0.03[a]) and 80g (1.96±0.02[b]). The highest Total chlorophyll content (2.06±0.03[a]) was recorded from 0g leaf mulch rate and lowest chlorophyll content (1.96±0.02[b]) from 80g.

Table 7: Mean separation result for the effect of leaf mulch at different weight on the Chlorophyll content of *Zea mays* in potting medium.

TREATMENT	Chlorophyll A	Chlorophyll B	Total Chlorophyll
0	1.06±0.01[a]	1.01±0.04[a]	2.06±0.03[a]
20	1.02±0.02[ab]	0.97±0.01[ab]	1.99±0.04[ab]
40	1.03±0.01[ab]	0.96±0.02[ab]	2.00±0.01[ab]
60	1.01±0.01[ab]	0.97±0.03[ab]	1.98±0.06[ab]

80	1.00±0.02[b]	0.96±0.01[b]	1.96±0.02[b]

Means with the same superscripts in column are not significantly different

4.1.8. Effect of leaf mulch at different weight on the Growth of *Zea mays* in potting medium

Table 8 shows the result of Leaf Production (LP), Leaf length (LL) and Stem height (SH) of Maize under different levels of leaf mulch.

There was no significant difference between the leaf production at 20g (4.40±0.28[b]), 40g (4.19±0.27[b]), 60g (4.30±0.32[b]) and 80g (4.20±0.31[b]), but they are significantly different from 0g (4.90±0.30[a]). The highest leaf production (4.90±0.30[a]) was recorded at 0g and the lowest leaf production (4.19±0.27[b]) at 40g.

There was no significant difference between the leaf length at 20g (30.07±1.31[b]), 40g (31.74±1.67[b]), 60g (29.44±1.80[b]) and 80g (32.56±1.24[b]), but they are significantly different from 0g (41.22±0.88[a]). The highest leaf length (41.22±0.88[a]) was recorded at 0g and lowest leaf length (29.44±1.80[b]) at 60g.

There was no significant difference between the stem height at 20g (17.26±0.75[b]), 40g (17.19±0.68[b]), 60g (16.37±0.72[b]) and 80g (17.15±0.81[b]), but they are significantly different from 0g (23.37±0.41[a]). The highest stem height (23.37±0.41[a]) was recorded at 0g, and the lowest is (16.37±0.72[b]) at 60g

Table 8: Mean separation result for the effect of leaf mulch at different weight on the Growth of *Zea mays* in potting medium.

TREATMENT(g)	Leaves production	Leaf length(CM)	Stem height(CM)
0	4.90±0.30[a]	41.22±0.88[a]	23.37±0.41[a]
20	4.40±0.28[b]	30.07±1.31[b]	17.26±0.75[b]
40	4.19±0.27[b]	31.74±1.67[b]	17.19±0.68[b]
60	4.30±0.32[b]	29.44±1.80[b]	16.37±0.72[b]
80	4.20±0.31[b]	32.56±1.24[b]	17.15±0.81[b]

Means with the same superscripts in column are not significantly different

Effects of leaf mulch of the selected agroforestry species on *Zea mays* on weeks after planting (WAP)

Table 9 shows the result of Leaf production (LP), Leaf length (LL) and Stem height (SH) at weeks after planting. Irrespective of the species, there was no significant difference between leaf production of the maize at 2WAP (2.78±0.08[c]) and 6WAP (5.89±0.17[c]), but are significantly different from 4WAP (4.40±0.14[b]). The highest LP was in 6WAP (5.89±0.17[c]) and least LP was in 2WAP (2.78±0.08[c])

There was no significant difference between leaf length at 2WAP (33.11±0.99[c]) and 4WAP (32.78±1.23[b]), but are significantly different from 6WAP (35.49±1.23[a]). The highest leaf length was in 6WAP (35.49±1.23[a]) and the lowest leaf length was in 2WAP (33.11±0.99[c]).

Finally, there was no significant difference between stem height at 2WAP (16.04±0.56[b]) and 4WAP (20.04±0.60[b]), but are significantly different from 6WAP (20.60±0.60[a]). The highest Stem height was in 6WAP (20.60±0.60[a]), and lowest Stem height was in 2WAP (16.04±0.56[b]).

Table 9: Mean separation for the effects of leaf mulch at different weeks after planting on the Growth of *Zea mays* in potting medium

Weeks	Leaf Production	Leaf Length(CM)	Stem Height(CM)
2WAP	2.78±0.08[c]	30.76±1.18[b]	16.04±0.56[b]

4WAP	4.40±0.14[b]	32.78±1.23[b]	20.04±0.60[b]
6WAP	5.89±0.17[c]	35.49±1.23[a]	20.60±0.60[a]

Means with the same superscripts in column are not significantly different

Effect of Selected agroforestry tree species leaf mulch (*Treculiaafricana, Enterolobiumcyclocarpium and Leucaenaleucocephala*) on the Growth of *Zea mays* in potting medium.

Table 10 shows the result of Leaf production (LP), Leaf length (LL) and Stem height (SH) of maize using leaf extract of the selected tree species. There was no significant difference between leaf production of the maize treated with TA (4.60±0.24[a]) and EC (4.76±0.24[a]), but they are significantly different from LL (3.7±0.18[b]). The highest leaf production EC (4.76±0.24[a]) EC and the least leaf production LL (3.7±0.18[b]).

There was no significant difference between the leaf length of the maize treated with TA (35.60±0.95[a]) and EC (36.88±0.82[a]), but they are significantly different from LL (26.53±1.28[b]). The highest leaf length EC (36.88±0.82[a]) and the least leaf length from LL (26.53±1.28[b])

Finally, there was a significant difference between stem height of the maize treated with TA (17.68±0.53[b]), EC (21.00±0.59[a]) and LL (16.11±0.60[c]), with highest Stem height (21.00±0.59[a]) from EC and the least Stem height (16.11±0.60[c]) from LL.

Table 10: Mean separation for the Effect of Selected agroforestry tree species (*Treculiaafricana, Enterolobiumcyclocarpium and Leucaenaleucocephala*) leaf mulch on the Growth of *Zea mays* in potting medium

SPECIE	Leaf Production	Leaf Length(cm)	Stem Height(cm)
TA	4.60±0.24[a]	35.60±0.95[a]	17.68±0.53[b]
EC	4.76±0.24[a]	36.88±0.82[a]	21.00±0.59[a]
LL	3.7±0.18[b]	26.53±1.28[b]	16.11±0.60[c]

Means with the same superscripts in column are not significantly different

V. CONCLUSION AND RECOMMENDATION

CONCLUSION

The total chlorophyll content of the maize plant reduced, also the growth rate reduced due to the application of the leaf extract and leaf mulch of *Leucaenaleucocephala,Treculiaafricana*and *Enterolobiumcyclocarpum*. The inhibitory effect can be attributed to presence of allelochemicals, and the stimulatory effect can be attributed to Nitrogen fixation, water infiltration, nutrient recycling and source of green manure.

Result obtained has shown that some of the selected agroforestry tree species have inhibitory allelopatic effects, majorly *Leucaenaleucocephala*, while some of it has Stimulatory allelopatic effect, *Treculiaafricana*majorly. Although it is generally acknowledge that tree can improve nutrient status of the soil particularly through litter return, however it has been observed in several studies that allelochemicals which are associated with decomposition process are being released alongside with nutrients, and this allelochemicals are suspected to to have negative effect on physiological process of crops even while the nitrogen released improve the soil status.

RECOMMENDATION

It is therefore recommending that;

- Further investigation on the effect of the agroforestry trees species on the soil nutrition component and also on the yield and growth of crops be carried out in the future
- Screening and analyses of other selected trees, to know the allelochemicals presents in it.
- The use of organic mulching material can help enhance growth of agroforestry crop such as maize
- From the study it was discovered that *Treculiaafricana* have less inhibitory effect on the growth and also the chlorophyll content of the maize but can serve as nitrogen fixing source to the soil

- There is need for more research in agroforestry Field, concerning the allelopatic relationship between agroforestry components, because just little attention is being given to this area.

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