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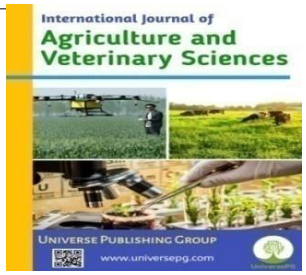

Herbage Yield Evaluation of Sesbania Tree Legume Lines (*Sesbania scopoli*) under Supplemental Irrigation

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ABSTRACT

The study was conducted to evaluate the performance of three indigenous perennial Sesbania tree legume lines under supplemental irrigation and advice the promising species as cultivated fodder for livestock producers. Randomized Complete Block Design of three Sesbania tree legume lines of *S. sesban* DZF-405, S. dummeri DZF-336, and *S. sesban* DZF-403 with three replications was used. The result showed that the agronomic performances of vigor, height, lateral branch less than 50cm and 100cm, diameter, survival, as well as dry matter percent, dry matter leaf-to-stem ratio, and dry matter yield in ton per hectare were not varied statistically ($P>0.05$) between the three Sesbania tree legume lines. However, the two *S. sesban* lines of DZF-405 and DZF-403 numerically produced more dry matter yield (Mean±SEM) in ton per hectare (6.23±1.07 and 6.24±1.07, respectively) than *S. dummeri* DZF-336 (3.29±1.07). Lateral branches less than 50 and 100cm were found high ($P<0.001$) during the first harvest (8.15±0.56 and 16.74±0.78) than second (3.3±0.39 and 6.59±0.78) and third (4.44±0.39 and 7.82±0.78) harvest, respectively. But, the diameter was significantly ($P<0.001$) low 2.88±0.24 during the first harvest. Dry matter yield in ton per hectare (8.7±1.07) and dry matter leaf-to-stem ratio (1.32±0.06) were found high ($P<0.001$) during the second harvest period. The two *S. sesban* cultivated fodder lines numerically yield better dry matter under Wondogenet environmental conditions. Under supplemental irrigation, the varieties are more productive and can give multiple harvests with a minimum of three times per year. It can be utilized as a cut-and-carry feeding system for fresh fodder or leaf hay. This smallholder farmer is preferably advised to use *S. sesban* lines of DZF-405 and DZF-403 under supplemental irrigation for livestock feed resources.

Keywords: Fodder, *Sesbania scopoli*, Irrigation, Legumes, Livestock, Performance, Sesbania, and Yield.

INTRODUCTION:

Agriculture contributes for the major livelihood and economic growth of Ethiopia's. Livestock productions in East African countries challenged by feed scarcity and climate change scenario and their economies are largely depends on climate-sensitive agricultural production systems. East African regions, including the Ethiopia are highly vulnerable to food and nutrition security. Similarly, increasing feed cost and environmental protection issues are some of the challenges facing the livestock industry. In Ethiopia, there was an increasing utilization of Sesbania fodder as a protein

source supplement of either grass or poor quality forage basal diet (Tessema & Baars, 2004).

According to CSA, (2021) Ethiopia report, green fodder or grazing (54.54%) followed by crop residue (31.13%) are found the major feed resources in the country. Hay and by-products were also contributed about 7.35 and 2.03 percent of the total feeds, respectively. About 4.37 percent were also used from other types of feed. However, improved feed resource contributions were by far too low that account to about 0.57% of the total feed sources of the country. This indicates further effort required on evaluation of improved cultivated fodder crops that adapt well and productive to the existing environmental conditions. Moreover, according to FAO, (2016) reports, utilization of improved fodder for livestock feed has an advantage of reducing greenhouse gas emission and improve livestock productivity of the country in a climate-smart manner. Improving productivity and quality through intensive use of improved forage crops cultivation and utilization practices is crucially important. It involves germplasm collection and or introduction of promising forage crops, evaluation for adaptation, yield and quality attributes resistance/tolerance to biotic and abiotic stresses (Aklilu & Asheber, 2019; Hossain *et al*., 2019).

Perennial species like Sesbania can be easily establish, well grow in hardy areas and maintain productivity with simple management practices. They have a lot features that make them attractive as multipurpose plants and potentially useful species for agricultural production systems (Gutteridge and Shelton, 1993). In Ethiopian highlands, the multi-purpose tree species of *Sesbania sesban* is used for livestock feed sources and soil conservation practices. The genus Sesbania contains 50 species. According to Gillett, (1963) the greatest species diversity of sesbania was found in Africa. The specific origin of *S. sesban* is unknown; however it is widely distributed and grown throughout tropical Africa and Asia countries (Heering *et al.,* 1996). The author also reported the greatest potential of *S. sesban* for multi-purpose tree and the leaves and young twinges are used as high protein fodder for ruminants, while the thick branches and stem provide fuel wood and construction materials. Furthermore it also helps to improve soil fertility and to reduce erosion (Heering and Gutteridge 1992; Degefu *et al.,* 2011). Similarly, Mengistu *et al.* (2002) reported that screening of multipurpose tree species like Sesbania species were found higher fodder yield production potentials in the mixed crop-livestock production systems (Nigussie, 2012) of the medium to high altitude areas of the country.

More importantly, (Orwa *et al.,* 2009; Sabra *et al.,* 2010); stated the high value of fodder nitrogen content of *Sesbania sesban* (L.) Merr make an important supplement to low-protein content roughage diets of ruminant or as substitute for commercial protein supplements (Mekoya *et al.,* 2009a). According to Orwa *et al.* (2009) report crude protein content and In vitro dry-matter digestibility of the foliage is often above 25% and 75%, respectively. The Nylon-bag dry-matter and nitrogen digestibility of dried *S. sesban* leaf is 90.7% and 96.7%, respectively. In addition to these, the low crude fiber content and high phosphorous levels indicate the potential of the species as a high-quality forage source. Zerihun & Getachew, (2013) reported a sustainable livelihood contribution of *S. sesban* for household food, nutrition and health security improvement. There is limited information of sesbania tree legume lines performance was found under Wondogenet environmental condition. Hence the aim of this research work is planned to evaluate the performance of three perennial sesbania species, under supplemental irrigation and advice the promising species to be used as a cultivated fodder for livestock feed resources.

MATERIALS AND METHODS:

Description of the study area

The experiment was undertaken collaborately in Wondogenet Agricultural Research center and Bangladesh researcher. The center is located at 07°19.1' North latitude, 38°30’ East longitude of 268 km to the South of Addis Ababa, capital city. The altitude of the area is 1780 meter above sea level. The area receives mean annual rain fall of 1128 mm with minimum and maximum temperature of 11 and 26°c, respectively (Tekalegn *et. al.,* 2017). The texture of the top soil (0-25cm) was sandy clay loam with pH 8.84 (1:2.5 soil water suspensions) and total nitrogen of 0.18.

Treatments and design

The experiment was conducted in Randomized Complete Block Design of three indigenous perennial Sesbania tree legume lines with three replications. The

three treatment lines employed for the study were *S. sesban* DZF-405, *S. dummeri* DZF-336 and *S. sesban* DZF-403. Before establishment, seeds were treated with acid-scarified by soaking in concentrated sulfuric acid for 30 minutes. In order to maintained uniform plant population, seedlings were established in plastic tubes filled with fertile soil. Two seeds were sown per tube and then thinned to one plant. During the first month of establishment, sprinkler water was provided twice every day in the morning and afternoon till the required filled capacity was reached. Then water was applied only once every evening for the second month. A total of nine experimental plots each with $16m^2$ (4mx4m) areas were prepared for fodder establishment. Seedlings were then transplanted into dug planting holes of 30cm wide and 30cm deep spaced 0.5m intra-row and 1.5m inter-row. The plot contained three rows, each consisting of 9 plants (27 plants per plot). The treatment groups were assigned randomly and independently to each experimental block. Management practices of hand-weeding, pest and disease monitoring or control were done uniformly.

Data collection

The collected data were stand vigor, plant height, lateral branches less than 50cm and 100cm, diameter, survival per plot, herbage yield, dry matter contents and leaf-to-stem ratio. Plant height, lateral branches less than 50cm and 100cm, and diameter were taken from average of three representative plants per plot from the middle of the rows. Plant height was measured using a graduated steel tape from the ground to the tip of plant. After one season of establishment, the fodder legumes were harvested at a fixed cutting height (0.75 m) that was established as appropriate for Sesbania (Mengistu *et al.,* 2002; Orwa *et al.,* 2009). Similarly lateral branches less than 50cm and 100cm height from the ground level were also counted accordingly. The stand vigor was taken by observational scores of zero to ten (100% vigor).

Estimation of Biomass and Dry Matter Yield

Biomass yield of the various perennial Sesbania tree legume fodder lines were harvested at proper stage. Weight of the total fresh biomass yield was measured using spring balance from each plot in the field. Sampled leaf and stem were separated and weighed to determined leaf-to-stem ratio. Subsamples of each 200g of leaf and stem were taken by sensitive balance and sent to the laboratory. Upon arrival at laboratory it was oven dried for 72 hours at temperature of 65°c. The oven dried samples were weighed to determine the total dry matter yield. Then the result was converted in to dry matter ton per hectare for comparison (Aklilu & Alemayehu, 2007; Ali *et al*., 2022).

Survival or reaction to diseases and pests

To determine the survival of the species and reaction to disease and pest tolerance, damaged or died plants were taken by counting the total number of Sesbania trees survived per plot.

Data Analysis

The collected data were analyzed using General Linear Model procedure of Statistical Analysis System (SAS, 2002- version 9.0). Least significant difference (LSD) test was employed for variables whose F-values declared a significant difference ($P<0.05$). The statistical model for data analysis was -

$$\mathbf{Y_{ijk} = \mu + t_i + b_j + e_{ijk},}$$

Where,

Y_{ijk} is the response variable under examination

μ is the overall mean

t_i is the treatment effect of sesbania tree legume fodders

b_j is the block effect/ random effect of experimental plots (j =3; 1, 2, 3) and

e_{ijk} is the random error associated with the observation ij.

RESULTS AND DISCUSSION:

Performance of the three perennial Sesbania tree legume lines

The agronomic performances of vigor, height, lateral branches less than 50cm and 100cm, diameter, survival, dry matter ratio, dry matter leaf-to-stem ratio and dry matter yield in ton per hectare were not vary statistically ($P>0.05$) between three perennial Sesbania tree legume lines (**Table 1**). However, the two *S. sesban* lines (DZF-405 and DZF-403) were numerically yield higher dry matter in ton per hectare of 6.23±1.1 and 6.24±1.1, respectively than *S. dummeri* (3.26±1.1 ton ha^{-1}). The dry matter yield in ton per hectare of this study was found in line with the report of Orwa *et al.* (2009), who reported yield ranged from

4 to 12 ton ha^{-1} dry matter per year, depending on location. However Ngasa & Gizahu, (2019) was found a higher average dry matter yield in tone per hectare of five *S. sesban (L.) Merril* species (17.27) than the present study (5.25±1.1). Even though *S. dumerri* yield lower dry matter, it has better leafy branches than the other two *S. sesban* species (Uddin *et al*., 2023).

Table 1: Performance of three perennial Sesbania lines (Mean±SEM).

Sesbania lines	Vigor (%)	Height (m)	LB<50cm	LB<100cm	Diameter	Survival/Plot	DMR	DMLSR	DMYTPH
S. sesban DZF-405	74.4±0.5	2.8±0.4	4.8±0.6	9.6±0.8	4.2±0.2	23.0±1.3	35.9±1.9	1.03±0.1	6.23±1.1
S. dummeri DZF-336	73.3±0.5	2.9±0.4	6.1±0.6	11.5±0.8	3.8±0.2	20.8±1.3	38.0±1.9	1.17±0.1	3.29±1.1
S. sesban DZF-403	74.4±0.5	2.8±0.4	5.0±0.6	9.8±0.8	3.6±0.2	24.8±1.3	35.5±1.9	1.0±0.1	6.24±1.1
Over all Mean	74.07±0.5	2.8±0.4	5.3±0.6	10.4±0.8	3.9±0.2	22.9±1.3	36.5±1.9	1.07±0.1	5.25±1.1
CV%	19.4	45.6	33.3	22	16.8	16.1	15.4	17	56.9
Sig	ns	ns	Ns	ns	ns	ns	ns	ns	ns

Sig= Significant level, ns= Non-significant, CV= Coefficient of Variation, S=Sesbania, SEM= Standard Error of Mean, m= Meter, LB=Lateral Branch, DMR= Dry Matter Ratio, DMLSR= Dry Matter Leaf-to-Stem Ratio, DMYTPH= Dry Matter Yield in Ton Per Hectare.

The dry matter leaf-to-stem ratio were comparable to the result reported by Denbela, (2022) who found 1.13, 1.07, and 1.06 for *Sesbania sesban L.* species of DZ-0040, DZ-0079 and DZ-32, respectively under supplemental irrigation condition. However the author reported a higher dry matter leaf-to-stem ratio of 1.27 for DZ-2002 perennial Sesbania species than the present study 1.17±0.1. Concurrently Wubshet *et al.* (2021) reported higher dry matter leaf- to-stem ratio values (0.23-0.313) of five *S. sesban* varieties at Highland of Eastern Harerghe. The variation in dry matter yield in ton per hectare as well as its leaf-to-stem ratio might be associated with the genetic materials of perennial Sesbania species, soil types and environmental conditions. Likewise, the performance variation contributed due to biological or genetic effects (Megersa & Feyisa, 2016; Elfeel & Elmagboul, 2016; Kebede *et al.,* 2017; Negasu & Gizahu, 2019; Sharmin *et al*., 2021).

Performance of three Sesbania tree legumes lines during different harvest periods

Harvesting cycle performance of perennial Sesbania tree legume lines were indicated in **Table 2**.

The result revealed that higher dry matter yield in ton per hectare (P<0.001) were found during the second harvest (8.7±1.1) than the first (2.19±1.1) and third (4.88±1.1) harvests. Consecutively the dry matter leaf-to-stem ratio were also obtained higher (P<0.001) during the second harvest (1.32±0.1) than the first (0.95±0.1) and third (0.93±0.1) harvests. This might be associated with growing habit of the trees which increased productivity at the second harvest and then tend to declined. Regarding to the lateral branches recorded at less than 50cm and 100cm, were higher (P< 0.001) during the first harvest (8.2±0.6 and 16.7±0.8) than second (3.3±0.4 and 6.6±0.8) and third (4.4±0.4 and 7.8±0.8) harvests, respectively. This shows that the three sesbania tree legume lines were developed more branches at early stage of maturity than the late stages. But, the diameter was found lower (P<0.001) at the first harvest period (2.9±0.2) than second (4.1±0.2) and third (4.7±0.2) periods. The higher diameter obtained at older age might be due to maturity of the tree legumes.

Table 2: Performance of three Sesbania lines during three harvesting periods (±SEM).

Harvest	Vigor (%)	Height (m)	LB<50cm	LB<100cm	Diameter	Survival/Plot	DMR	DMLSR	DMYTPH
1st	80.0±0.5^{a}	2.3±0.4	8.2±0.6^{a}	16.7±0.8^{a}	2.9±0.2^{b}	26.8±1.3^{a}	38.4±1.9	0.95±0.1^{b}	2.19±1.1^{b}
2nd	83.3±0.5^{a}	2.9±0.4	3.3±0.4^{b}	6.6±0.8^{b}	4.1±0.2^{a}	27.2±1.3^{a}	37.6±1.9	1.32±0.1^{a}	8.7±1.1^{a}
3rd	58.9±0.5^{b}	3.2±0.4	4.4±0.4^{b}	7.8±0.8^{b}	4.7±0.2^{a}	14.6±1.3^{b}	33.6±1.9	0.93±0.1^{b}	4.88±1.1^{b}

Mean	74.1±0.5	2.82±0.4	5.3±0.4	10.4±0.8	3.9±0.4	22.9±1.3	36.5±1.9	1.07±0.1	5.25±1.1
CV%	19.4	45.6	31.6	22	16.8	16.1	15.4	17	56.9
Sig	**	Ns	***	***	***	***	ns	***	***

[ab]Means bearing different superscripts along the column differ significantly, Sig= Significant level, **. ***=Significant at 0.01 and 0.001 level, ns= Non-significant, CV= Coefficient of Variation, SEM= Standard Error of Mean, LB=Lateral Branch, DMR= Dry Matter Ratio, DMLSR= Dry Matter Leaf-to-Stem Ratio, DMYTPH= Dry Matter Yield in Ton Per Hectare.

Average dry matter content of three Sesbania tree legume lines

The average dry matter percent of perennial sesbania species tree legume lines across harvesting periods were indicated in **Fig. 1**. Even though, the result revealed that no variations (P>0.05) in dry matter percent values among the lines, the two lines of *Sesbania sesban* DZF-405 and DZF-403 were numerically recorded higher dry matter contents of 37.3% and 38.4% during the second harvest periods, respectively. However, *Sesbania dummeri* DZF-336 line was found better dry matter percent (43.6%) during the first harvest period (Shahen *et al*., 2019).

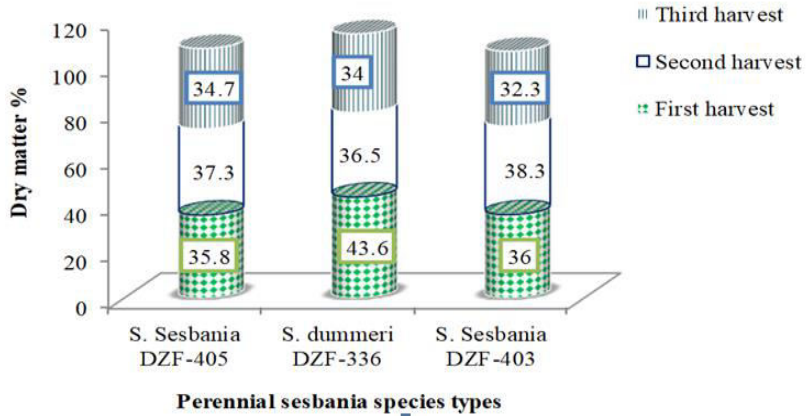
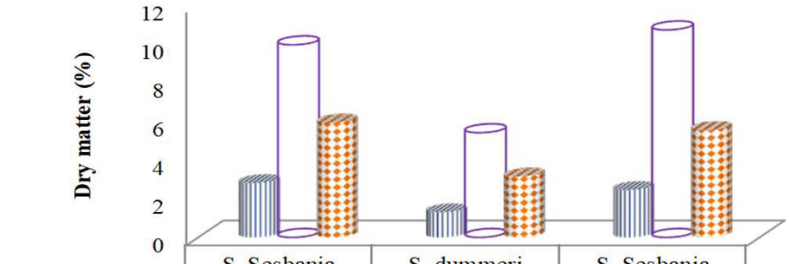


Fig. 1: Average dry matter percent of three Sesbania lines

Average dry matter yield of three Sesbania line over harvesting periods

The average dry matter yield in ton per hectare of the three Sesbania tree legume lines across various harvesting periods were found highest during the second harvest period (**Fig. 2**). During this harvest period 9.95, 5.41 and 10.72 ton per hectare of dry matter yield were obtained by *Sesbania sesban* DZF-405, *Sesbania dummeri* DZF-336 and *Sesbania sesban* DZF-403, respectively.



	S. Sesbania DZF-405	S. dummeri DZF-336	S. Sesbania DZF-403
First harvest	2.81	1.3	2.45
Second harvest	9.95	5.41	10.72
Third harvest	5.94	3.15	5.56

Fig. 2: Average dry matter yield in ton per hectare of three Sesbania lines.

In contrast, *S. dummeri* DZF-336 was produced the lowest amount of dry matter yields in ton ha^{-1} across all harvesting cycles than both *S. sesban* DZF-405 and DZF-403 tree legume lines. The result revealed that all

of the Sesbania tree legume lines dry matter yields were increased during the second harvest period and then tends to decline at the third harvest. This situation might be related with the growth nature of the tree legumes as well as environmental condition of the area.

Average leaf-to-stem ratio of Sesbania tree legume lines

The average dry matter base leaf-to-stem ratio of the perennial Sesbania tree legume lines were showed in **Fig. 3**. During the second harvest period *Sesbania sesban* DZF-405, *Sesbania dummeri* DZF-336 and *Sesbania sesban* DZF-403 lines were recorded the highest leaf-to-stem ratios of 1.43, 1.41 and 1.13, respectively.

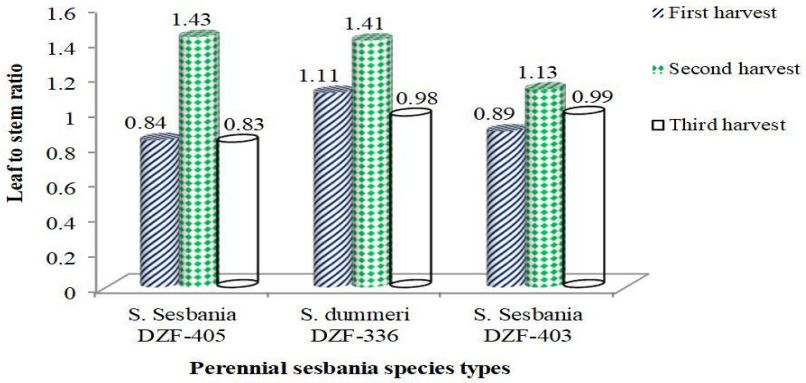


Fig. 3: Average dry matter leaf-to-stem ration of three Sesbania tree lines.

However the first and third harvest leaf-to-stem ratios of each perennial Sesbania tree legumes fodder were found comparable. Relatively, the leaf parts of the fodder are more palatable and nutritious than the stem ones. So the higher the leaf-to-stem ratio beats the better advantage of fodder productivity and quality. The result showed that the two *Sesbania sesban* (DZF-405 and DZF-403) fodder tree legume lines were better in fodder productivity and qualities at second harvest.

CONCLUSION:

Feed scarcity both in quality and quantity are the major challenges of livestock production. The results indicated no statistical variation on the agronomic performances, dry matter contents, dry matter leaf-to-stem ratios and dry matter yield in ton per hectare among the three perennial Sesbania fodder tree legume lines. However, numerically *S. sesban* DZF-405 and *S. sesban* DZF-403 were found better dry matter yield in ton per hectare. While *Sesbania dummeri* DZF-336 yield better in dry matter leaf-to-stem ratio than the two *S. sesban* species. Moreover, statistically higher dry matter leaf-to-stem ratio and dry matter yield in ton per hectare were obtained during the second harvest period of the fodder legumes. Under supplemental irrigation the varieties are more productive and can give as multiple harvests with minimum of three times per year. It can be utilized as cut-and-carry feeding system as fresh fodder or leaf hay. Therefore, small holder farmers are preferably advice to use *S. sesban* DZF-405 and *S. sesban* DZF-403 tree legume fodders under supplemental irrigation of Wondogenet condition.

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CONFLICTS OF INTEREST:

The authors declare no conflict of interest.

REFERENCES:

1) Aklilu M, Alemayehu M. (2007). Measurements in pasture and forage cropping systems. Technical manual, **18**. *Ethiopian Agricultural Research Institute*.
2) Aklilu M, Lisanework N, and Alan J Duncan. (2014). Inter-connection between land use/land cover change and herders'/farmers' livestock feed resource management strategies: a case study

from three Ethiopian eco-environments. *Agriculture, Ecosystems & Environment*, **188**, 150-162.

3) Ali MA, Alam MM, and Haque MN. (2022). Effect of hill temperature on wheat variety development and yield in the district of Khagrachari. *Am. J. Pure Appl. Sci*., **4**(6), 103-114. https://doi.org/10.34104/ajpab.022.01030114
4) Central Statistical Agency (CSA), (2021). Agricultural Sample Survey. Livestock and Livestock Characteristics (Private Peasant Holdings). *Statistical bulletin*, **589**(2), 36-38.
5) Degefu T, Wolde-meskel E, and Frostegard A. (2011). Multilocus sequence analyses reveal several unnamed Mesorhizobium genospecies nodulating Acacia species and *Sesbania sesban* trees in Southern regions of Ethiopia. *Syst. Appl. Microbiol*, **34**, 216-226. https://doi.org/10.1016/j.syapm.2010.09.006
6) Denbela H. (2022). Evaluation of Biomass Yield and Quality Parameters of Sesban (*Sesbania sesban L.*) Varieties in Irrigated Lowland of Dassench District of South Omo, *South-Western, Ethiopia*. **4**(1), 1438-1442. OAJBS.ID.000374. https://doi.org/10.38125/OAJBS.000374
7) Elfeel AA, and Elmagboul A H. (2016). Effect of planting density on *leucaena leucocephala* forage and Woody stems production under arid dry climate. *Inter J Envi. & Agri. Res*, **2**(3), 7-11.
8) FAO, (2016). Ethiopia Climate-Smart Agriculture Scoping Study. *Addis Ababa*.
9) Gillett JB. (1963). Sesbania in Africa (excluding Madagascar) and southern Arabia. *Kew Bulletin*, **17**(1), 91-159.
10) Gutteridge RC, and Shelton HM. (1993). The scope and potential of tree legumes in agroforestry. *Agroforest Syst*, **23**, 177-194. https://doi.org/10.1007/BF00704914
11) Heering HJ, Nokoe S, Jemal S. (1996). The classification of Sesbanis sesban (ssp. Sesban) collection. Morphological attributes and their taxonomic significance. *Tropical Grasslands*. **30**, 206-2014.
12) Heering JH, and Gutteridge RC. (1992). *Sesbania sesban* (*L.*) Merrill, Pp. 198-201. In: Mannetje, L. `t and Jones, R.M. (eds) Plant Resources of South East Asia, **4**, *Forges*. (*Pudoc: Wageningen, the Netherlamds*).
13) Hossain SM, Sarker C, and Mahmud S. (2019). Effect of plant growth regulator on the growth and high yield of heat tolerant tomato variety (*Lycopersicon esculentum* Mill). *Am. J. Pure Appl. Sci*., **1**(5), 30-43. https://doi.org/10.34104/ajpab.019.0193043
14) Kebede G, Minta M, and Tesfaye M. (2017). Determination of appropriate seeding rate for oats/vetch mixtures grown under different drainage conditions of vertisols in the central highlands of Ethiopia. *J Agric. Crop Res*. **5**(5), 85-95.
15) Megerssa Endebu, and Feyisa Girma. (2016). Sesbania sesban, a fodder species potential to rehabilitate wetland vegetation in Lake Ziway, Ethiopia. *Inter J. of Fisheries & Aquatic Studies*. **4**(3), 298-301. www.fisheriesjournal.com
16) Mekoya A, Oosting S J, and Van der Zijpp A J. (2009a). Effect of supplementation of *Sesbania sesban* on post-weaning growth performance and sexual development of Menz sheep (Ethiopia). *Livestock Sci*. **121**,108-116.
17) Mengistu S, Keftasa D, and Yami A. (2002). Productivity of four sesbania species on two soil types in Ethiopia. *Agroforestry Systems*, **54**, 235-244.
18) Negasu G, Gizahu W. (2019). Adaptation Study of Improved Fodder Tree (*Sesbania Sesban (L.) Merril*) at Haro Sabu, Kelem Wollega, Oromia, Ethiopia. *Inter J Research-Granthaalayah*, **7**(8), 212-219. https://doi.org/10.5281/zenodo.3381306
19) Nigussie Z. (2012). Contribution of White Lupin (*Lupinus albus L.*) for food security in North-Western Ethiopia: A Review. *Asian J Plant Sci*, **11**(5), 200-205. https://doi.org/10.3923/ajps.2012.200.205
20) Orwa C, Mutua A, and Anthony S. (2009). Agroforestree Database: a tree reference and selection guide, **4**. https://doi.org/10.1016/j.livsci.2008.06.012
21) Sabra HA, Hassan SG, Mohamed MI. (2010). Effect of *Sesbania sesban* (*Sesbania egyptiaca*) Supplementation on the Reproductive Performances of Baladi Sheep as Compared to Bere-

seem (*Egyptian clover*). *J Reprod. Infertil*. **1**(3), 66-70.

22) SAS, (2002). Statistical Analysis System. **9**, *SAS Institute, Inc., Cary, NC, USA*.
23) Shahen MZ, Mahmud S, Uddin ME and Alam MS. (2019). Effect of antibiotic susceptibility and inhibitory activity for the control of growth and survival of microorganisms of extracts of *Calendula officinalis*, *Eur. J. Med. Health Sci*. **1**(1), 1-9. https://doi.org/10.34104/ejmhs.0190109
24) Sharmin S, Parvin R, and Habiba U. (2021). Response of different doses of nitrogen fertilizer on growth and yield of KangKong (*Ipomoea reptans poir*). *Am. J. Pure Appl. Sci*., **3**(4), 98-105. https://doi.org/10.34104/ajpab.021.0980105
25) Tekalegn Y, Solomon M, Edao S, Fromsa I. (2017). Desho Grass (*Pennisetum pedicellatum*) Lines Evaluation for Herbage Yield and Quality under Irrigation at Wondogenet. *American-Eurasian J Agric. & Environ. Sci*, **17**(5), 427-431.
26) Tessema Z, Baars RMT. (2004). Chemical composition, in vitro dry matter digestibility and ruminal degradation of Napier grass (*Pennisetum purpureum* (*L.*) Schumach.) mixed with different levels of *Sesbania sesban* (*L.*) Merr. *Anim. Feed Sci. Technol*. 117, 29-41. https://doi.org/10.1016/j.anifeedsci.2004.08.001
27) Uddin ME, Afrin Z, Kundu SK, and Khan MMH, (2023). Ameliorate and Standardization of the *In vitro* Micropropagation of Night-blooming Jasmine (*C. nocturnum* L.), *Emerging Issues in Agricultural Sciences*, 2, Page 166-180. https://doi.org/10.9734/bpi/eias/v2/3938B
28) Wubshet T, Tolera F, and Melese F. (2021). Performance Evaluation of Improved Forage Trees (*Sesbania sesban*) Cultivars for Animal feed and Nutritional Quality in High-lands of East Hararghe Zone, Oromia, Ethiopia. *Food Science & Quality Management*, **106**, 7-11
29) Zerihun N, and Getachew A. (2013). *Sesbania sesban* (*L.*) Merrill: Potential uses of an underutilized multipurpose tree in Ethiopia. A review. *African J Plant Sci*. **7**(10), 468-475. https://doi.org/10.5897/AJPS2012.0716

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