IMPROVING SORGHUM BIOMASS AND PRODUCTIVITY THROUGH APPLICATION OF MORINGA LEAF JUICE

Research Article

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Abstract

Globally, fourteen types of Moringa species are discovered. Among these species Moringaoleifera and Moringastenopetala potentially use for nutritional purpose, medicinal and feed values. In addition to these, Moringa leaf juice is being use in the form of a foliar spray that causes the plants to be stronger, more resistant to pests and disease and enhances plant growth. Plants treated with Moringa juice spray produce more and larger fruit and consequently have higher yield. The study conducted at "Kewet" district, Shewa Robit site with the objective of evaluating the contribution of Moringa leaf juice on grain yield and biomass production of sorghum. The result indicated that there was no significant difference observed among treatments on grain yield. However, foliar spray of Moringaoleifera with fertilizer and Moringastenopetala with fertilizer was obtained 25% and 34% of grain yield advantage as compare to only chemical fertilization application. Hence, at Shewarobit condition, foliar spray of Moringa leaf juice is not recommended for sorghum grain yield production. However further study is required across different soil type and agro climatology.

Key words

Moringaoleifera, Moringastenopetala, Sorghum, Grain Yield

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INTRODUCTION

Moringa tree or plant belongs to the family *Moringaceae*. The family consists of a single genus with about fourteen species (Verdcourt, 2000). Among these, the best studied in regarding different purposes is *Moringastenopetala* and *Moringaoleifera*. These species are the most domesticated of the genus (Yalemtsehay Mekonnen, 2003). *Moringastenopetala* is endemic to East Africa and mainly present in northern Kenya and Ethiopia. This native species is the second most important regarding to domestication but has a higher genetic base than *Moringaoleifera.* According to the Flora of Ethiopia, the species occurs in Kaffa, Gamo-Gofa and Sidama, between 500 and 1600 m.a.s.l and in conditions extend to 2000 m.a.s.l (Edwards et al., 1996). *Moringaoleifera* is an important food commodity that has had enormous attention as the natural nutrition of the tropics. The leaves, fruit, flowers and immature pods of Moringa trees/plants are used as a highly nutritive vegetable in many countries, particularly in India, Pakistan, Philippines, Hawaii and many parts of Africa (Dsouza and Kulkarni, 1993; Anwar and Bhanger, 2003; Anwar et al., 2005).

In addition the above-mentioned purposes, Moringa leaf juice extract with 80% ethanol contains growth enhancing hormones. The extracted juices used as in the form of a foliar spray; accelerate the growth of young plants. Plants treated by Moringa growth hormone produce more and larger fruit and consequently, increases yield by 25-30% many crops such as onions, bell pepper, soya, maize, sorghum, coffee, tea, chili, and melon. Research findings indicated that application of Moringa leaf juice on maize crop increased the yields from 60 to 130 quintal per hectare (Foidl et al., 2001). Hence, this research was conducted to evaluate the effect of Moringa leaf juice application on sorghum biomass and grain yield production at Shewa robit condition.

Objectives

To test the contribution of Moringa leaf juice on grain yield and biomass production of sorghum crop.

MATERIALS AND METHODS

Description of the study area

The study was conducted at Kewet district at Shewa robit which is located at 10º 5' 32''N latitude and 39º 54' 51"E longitude with an elevation of 1259 m.a.s.l. in north Shewa zone, Amhara region (figure1), Ethiopia. The district is about 220 km north east of Addis Ababa. The mean annual rainfall ranges 868 mm to 1386 mm and the mean minimum and seasonal maximum temperature is 14.2^0c and 30.1^0c respectively.

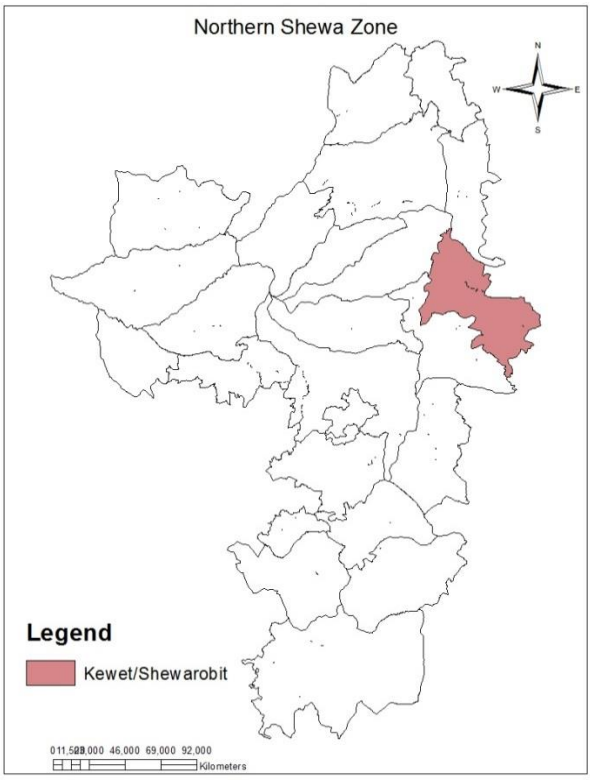

Figure 1: Map of study area

Method of extraction and application of Moringa leaf juice

Seedlings of *Moringaoleifera and Moringastenopetala* species grown at Shewarobit nursery site before one and half months of extraction of juice was made. Extraction done by grinding young Moringa leave by mortar together with 80% ethanol (Martin Price, 2007). Then solid materials were filtered by placing the solution in a white cloth and wringing out the liquid. Finally, dilution of the extracted Moringa juice by water 1:36 ratio and apply 25ml per plant directly on test crops within five hours. The foliar spray applied at three stages; 10 days after the moment plants emerge; plants begin to flower and at maturity stage.

Experimental design and crop management

The experiment were carried out on sorghum bicolor (Teshale variety) with four treatments (fertilizer with *Moringaoleifera* juice *(MOF),* fertilize with *Moringastenopetala* juice *(MSF)*, Only *Moringaoleifera* juice *(MO),* Only *Moringastenopetala* juice *(MS)* and *Only fertilizer (FO)*) as control were used in 3 m x 5 m plot size in randomized complete block design with three replication at three experimental sites. The space between blocks and plots were 2m and 1m, respectively and between plants and rows were 15 cm and 75 cm, respectively. Above ground biomass, plant height, grain yield, numbers of tiller per plant and root biomass were collected and analyzed through SAS statistical package. Significant differences among treatment were tested using Duncan's Multiple Range Test at 0.05 significant levels.

RESULT AND DISCUSSION

Effect of Moringa leaf juice on grain yield and plant height

The result indicated that an application of Moringa leaf juice on sorghum bicolar (*Teshal variety*) there was no significant difference observed on grain yield in all experimental sites. Although there is not significant variations observed between treatments yet, use of foliar spray of *Moringaoleifera* juice with fertilizer and *Moringastenopetala*

juice with fertilizer to some extent increases sorghum grain yield by 25% and 34% over only fertilizer use. This result in line with for many crops such as onions, bell pepper, maize, sorghum, coffee, tea, chili, and melon yields increased by 25-30% as a result of Moringa leaves juices sprays (Foidl et al., 2001).

Table 1: Effects of Moringa leaf juice on plant height (cm), and grain yield (Ql ha^{-1}) on sorghum bicolar at Shewa robit/Kewet

Treatments	Cropping seasons									
	2011/12								2012/13	
	Experimental sites									
	On-station		**Kobo**		**Wanza**		**average**		**On-station**	
	GY	Ht	GY	Ht	GY	Ht	GY	Ht	GY	Ht
MSF	56.13	226	35.26	215a	39.08	195	43.48a	212	63.7a	242.9a
MOF	51.53	227	31.95	208ab	38.56	194	40.69a	210	64.3a	243.2a
FO	43.13	248	29.07	212a	24.4	190	32.35b	217	63.41a	237.5a
MO	41.80	219	27.39	193ab	23.67	182	30.95b	198	47.7b	200.6b
MS	41.23	222	28.73	181b	24.4	189	31.45b	197	52.44ab	226.3a
c.v.	17.00	10.36	17.95	7.48	30.04	9.83	20.8	9.02	10.1	4.8

Columns with the same letters are not significant different.
Where:
MSF (Moringastenopetala with fertilizer), MOF (Moringaoleifera with fertilizer), FO (fertilizer only), MO (Moringaoleifera only) and MS (Moringastenopetala only).

Effect of Moringa leaf juice on plant biomass

The result indicates that application of Moringa leaf juice with fertilizer on sorghum bicolor above ground biomass and the numbers of tillers per plant was significant variation observed between treatments. But root biomass and number of tiller per plant didn't show significant variation (Table 2). Application of *Moringastenopetala* leaf juice with fertilizer and *Moringaoleifera* with fertilizer increases above ground biomass by 7% and 38% as compared to only fertilizer application.

Table2. Effect of Moringa leaves juice on sorghum biomass yields in 2012/13 at Shewa robit site.

Treatments	above ground biomass (ton ha^{-1})	root biomass (kg) per plan	Number of tiller per plant
MSF	13.650b	0.382	1.70
MOF	17.710a	0.323	1.65
FO	12.777bc	0.317	1.60
MO	9.867cd	0.313	1.56
MS	8.970d	0.273	1.50
CV	14.8	22.8	5.7

Columns with the same letters are not significant different.
Where:
MSF (Moringastenopetala with fertilizer), MOF (Moringaoleifera with fertilizer), FO (fertilizer only), MO (Moringaoleifera only) and MS (Moringastenopetala only).

CONCLUSION AND RECOMMENDATION

Application of Moringa leaf juice on sorghum bicolor has not shown that significant variation in grain yield among treatments while above ground biomass was significantly different. Even if there is no statically significant variation observed, *Moringaoleifera* and *Moringastenopetala* leaf juice application on sorghum bicolor offer more than 8 and 11 Quintal per hectare respectively as compare to only fertilizer application. Hence, we can conclude that foliar spray application of Moringa leaf juice for sorghum grain yield production is not recommended at Shewa robit condition. Nevertheless some quintal difference is there, further study needed on cost benefit analysis of application of Moringa leaf juice for sorghum grain yield production.

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