

Assessment of the Invasive Alien Plant Species *Mimosa diplotricha* in Shebe-Sombo, Kersa and Seka-Chekorsa Districts, Jimma Zone, Southwest Ethiopia

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Abstract: Invasive Alien Species (IAS) has been causing serious threats to biodiversity which need to be addressed and studied seriously. *Mimosa diplotricha* is an invasive plant in some parts of Africa and has recently come to Ethiopia, particularly, in Oromia Regional State, Jimma Zone. Therefore, the objective of this study was to assess the impacts, trends, mode of entry, status, distribution and management practices of *Mimosa diplotricha* in Jimma Zone, Southwest Ethiopia. Accordingly, an assessment was carried out in Jimma zone, Shebe-sombo, Kersa and Seka-chekorsa districts, in 72 randomly selected households in six different *Kebeles* (the smallest administrative unit in Ethiopia). Based on the interview and field observation, the level of *Mimosa diplotricha* invasion was very high and the plant was the most dominant IAS on road side in the study areas. *Mimosa diplotricha* was introduced to the study sites during road construction together with sand, stones and other construction materials. Almost all of the respondents (98.6%) reported that *Mimosa diplotricha* had no any benefit in the study areas. Most of the informants (94.5%) replied that the negative impacts of *Mimosa diplotricha* in the future will be very high. The result of the study showed that there was no effective action taken to control *Mimosa diplotricha* in the study areas. Moreover, majority of the respondents believed that collaboration among governmental, non- governmental organization and communities and effective management measures are in need in order to control the spread of *Mimosa diplotricha*.

Keywords: *Mimosa diplotricha*, Invasive Alien Species, Biodiversity and Respondents

1. Introduction

Invasive Alien Species an alien species which their introduction and/or spread threaten biological diversity. Alien Species refers to a species or subspecies introduced outside its natural past or present distribution; includes any part, gametes, seeds and eggs of such species that might survive and subsequently reproduce. Ethiopia has a long history of introduction of alien species of plants and animals, especially those which were found to be productive elsewhere and offered potential economic benefits to the country. As in many other countries in the tropics hundreds of alien species have entered to Ethiopia, intentionally and unintentionally [3, 6, 9].

Invasive Alien Species have been identified as the second

cause of species extinction at the world level next to habitat deterioration or loss), affecting, in particular, the biological diversity of islands and evolutionary-isolated ecosystems. The extraordinary increase in the movement of wild species has accelerated the rate of introduction of new alien species everywhere, with deleterious consequences on native biological diversity [3]. Invasive Aliens Species (IAS) are of great concerns in Ethiopia, posing particular problems on biodiversity of the country, agricultural lands, rangelands, national parks, waterways, lakes, rivers, power dams, roadsides and urban green spaces with great economic and ecological consequences. Among these parthenium weed (*Parthenium hysterophorus*), prosopis (*Prosopis juliflora*), water hyacinth (*Eichhornia crassipes*), cactus (*Euphorbia stricta*), *Mimosa diplotricha* and lantana weed (*Lantana*

camara) were reported by [10].

Mimosa diplotricha is regarded as one of the worst weeds in Australia because of its invasiveness, potential for spread, and economic and environmental impacts [8, 9]. *Mimosa diplotricha* forms dense stands that replace all native vegetation on the ecologically and economically valuable wetlands of the top end of Northern Australia [6, 8]. *Mimosa* invasion threatens the production, cultural and conservation values of wetlands, and reduces the scope for exploitation of resources by land users. Pastoralists are affected because the inedible and thorny *Mimosa diplotricha* smothers and replaces grasslands; blocks access to stock watering points and hinder mustering. In addition, the cultivation of bush foods by indigenous people is hampered by *Mimosa diplotricha* [11, 7, 2, 8].

There are evidences that indicate the presence of the plant in Southwestern Ethiopia for more than 20 years with the name *Mimosa invisa*. Each leaf has about 20 pairs of small leaflets, bi-pinnate, sessile, opposite, acute, 6 to 12 mm long and 1.5 mm wide. The leaves are sensitive to disturbance and hence called giant sensitive plant. Flowers are small, pink and clustered in fluffy balls. Spiny seed pods contain three to four one-seeded segments. The seeds are flat, ovate, spiny, 2 to 2.5 mm long and 0.6 to 1.4 mm thick that are glossy and light brown [5, 2].

Little is known about the impact, distribution pattern, management practices, mode of entry, trend and status of *Mimosa diplotricha* in Ethiopia. Therefore, this research aims at assessing the impact, distribution pattern, management practices, mode of entry, trend and status of *Mimosa diplotricha* in *Shebe-sombo*, *Kersa* and *Seka-chekorsa* districts of Southwestern Ethiopia, Jimma Zone, Oromia Regional State.

2. Materials and Methods

2.1. Description of the Study Area

Jimma is one of the 18 zones found in Oromia Regional State with Jimma City as its capital. Jimma Zone consists of 17 districts with 538 Peasant Associations (PAs). There are 31 urban centers (towns with more than 2000 inhabitants) in Jimma Zone which mainly boost the opportunity for farmers to sell out their agricultural products and also to buy the necessary agricultural inputs. In terms of population, Jimma zone has a total human population of 2,607,115 of which 1,295,764 are female. More than 80% of the populations live in rural parts of the districts [1].

In terms of Agro-ecology, Jimma Zone enjoys seven different types of climate conditions which include, *Moist Dega* (Afro-montane forest woodland) (21.675 ha), *Moist Kolla* (Moist lowland) (73445.047 ha), *Moist Weinadega* (moist midland) (125216.83 ha), *Wet Dega* (Afro-montane forest-bamboo) (233401.823 ha), *Wet Kolla* (wet lowland) (99268.614 ha), *Wet Weinadega* (wet midland) (1280822.049 ha) and *Wet Wurch* (Sub-alpine) (438.173 ha). From this, one can easily observe that the larger part of the land lies under

Afro-montane forest-bamboo, moist midland and wet midland. Whereas Wet lowland, Moist lowland, Afro-montane forest woodland and Sub-alpine in aggregate cover less than 25% of the total existing hectares of land of Jimma Zone. The total area of the zone is 1,812,614.217 ha [1].

2.2. Data Collection

Field study on the impacts, trends, mode of entry, spread, status, distribution and management practices of *Mimosa diplotricha* in Jimma zone, Shebe-sombo, Kersa and Seka-chekorsa districts, Oromia regional state was conducted. The study districts were selected purposively on the basis of the level of *Mimosa diplotricha* invasion with the help of information obtained from Jimma zone Agricultural office.

Based on the above selection criteria from the three districts, the study was conducted only on six representative *kebeles*. From each district two *Kebeles* (the smallest administrative unit in Ethiopia) were selected based on the invasion of *Mimosa diplotricha* according to the information obtained from district agricultural office. Accordingly, *Atrogefere*, *Sebeka-debye*, *Merewa*, *Babo*, *Shashemene* and *Buyo-kechema* were selected to conduct this research. From each Kebele 12 households were selected randomly bringing the total number of sampled households to 72.

Data was collected from primary sources. The primary data was collected through Semi-Structured interview, preference ranking and Field observation. Secondary source of data was obtained from the agricultural office of the districts, from different books, journal and research article.

2.3. Data Analysis

The collected data was analyzed by using SPSS (statistical package for social sciences). A descriptive statistical method was employed to analyze and summarize the data and to calculate percentages, means and other measures of central tendencies.

3. Results and Discussions

3.1. Households Characteristics

From the total respondents, 37.5% of the household heads were aged between 36 and 50, while a little below half of the household heads (47.2%) were aged between 20 and 35, 15.3% of the households were aged between 51 and 75. Most of the respondents were males (63.9%) and only a few of them were females (36.1%). The main reason for the large number of male headed households was due to the general fact that prevailed in Ethiopia where males are considered as the head of the household or the owner of the land while female mostly participate/work at home.

As to the education status of the households, 29.2% of the respondents were uneducated, while 30.6% of the participants studied primary (first cycle, 1–4 grade) education, 27.8% and 12.5% of the household heads were educated up to primary level (Second cycle, 5–8 grade) and Secondary High School (9–10 grade) respectively. The educational level of the

households was from uneducated households up to Secondary high School (9–10 grades). Assessment in the marital status and job category of the respondents indicated that all of the respondents were found to be married and farmers respectively. Concerning number of years lived by the respondents in the study Kebeles, 58.3% of the respondents lived in the study Kebeles for 5-35 years, while 31.9% and 9.7% of them lived for 36-50 and 51-75 years respectively.

3.2. Respondents Estimate on the Status of *Mimosa Diplotricha*

Most of the respondents (93.1%) reported the level of invasion by *Mimosa diplotricha* as high level, 5.6% and 1.4% of them reported its level invasion as intermediate and lower level respectively (Figure 1). As field observation and from the respondents report, the level of *Mimosa diplotricha* invasion was very high in the study area particularly around the main road. Similar study was conducted on an invasive alien weed giant sensitive plant (*Mimosa diplotricha Sauvalle*) by [5] reported almost similar result.

In addition to *Mimosa diplotricha* there were also other different invasive alien species in the study area. From field observation and as the respondents reported the most dominant invasive alien species in the study area was *Mimosa diplotricha* followed by *Parthenium hysterophores*. Other invasive alien species such as *Striga hermonthica* and *Lantana camara* were also rarely found in the study area. Moreover, 100% of the respondents in the study kebeles were familiar with the invasive alien species, *Mimosa diplotricha*. [4] also reported almost similar result on *Parthenium hysterophorus* L. in *Sheka* zone, south western Ethiopia.

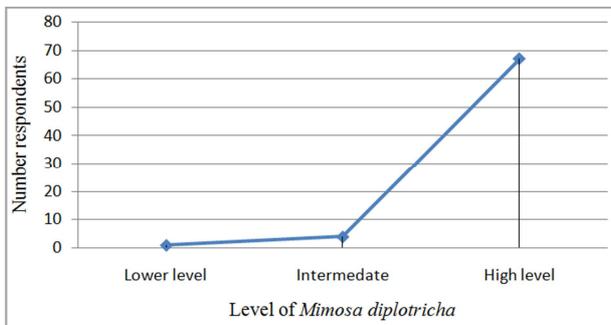


Fig. 1. Level of *Mimosa diplotricha* in the study area.



Fig. 2. Level of invasion by *Mimosa diplotricha* in the study area (Photo: Anteneh Tamirat and Amare Seifu November 2015, 20 km along the main road from Jimma city to Seka-Chekorsadistrict).

Almost all of the respondents (98.6%) believed that there is currently a much more increase in the spread of *Mimosa diplotricha* in the study area when compared to the previous time (Table 1).

Table 1. Comparison of the previous and current spread of *Mimosa diplotricha* in the study area.

Level	Frequency	Percent	Cumulative Percent
Valid Increasing	71	98.6	98.6
Valid Remain Constant	1	1.4	100.0
Total	72	100.0	



Fig. 3. Infestation of *Mimosa diplotricha* along the road side (Photo: Anteneh Tamirat and Amare Seifu November 2015, 50 km along the main road between Jimma city and Shebe-sombo district).

As to the means of entry of *Mimosa diplotricha* to an area, out of the total respondents, 87.5% of them reported that *Mimosa diplotricha* was introduced to their localities during road construction, 9.7% gave no information and 2.8% mentioned its entry with released agricultural seeds. Most of the respondents believed that *Mimosa diplotricha* was introduced to their localities during road construction along with sand, stone and other construction materials. Study conducted on an invasive alien weed giant sensitive plant (*Mimosa diplotricha Sauvalle*) by [5] also reported almost similar result.

Respondents in the study area believed that *Mimosa diplotricha* was introduced to their localities of which most of them (83.3%) reported its introduction as 10 years before, 4.2% of them as 20 years before, 6.9% of them as 30 years before, 2.8% of them as 40 years before while 2.8% of them did not have any information (Fig. 4).

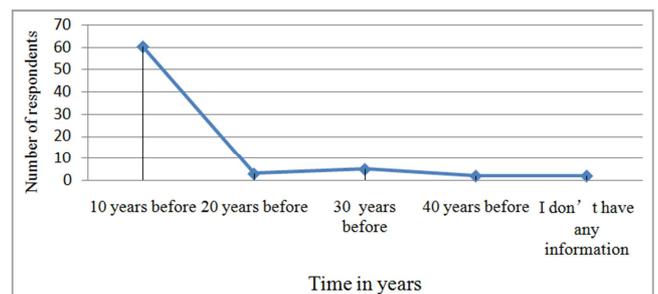


Fig. 4. Respondents paired in number of years of *Mimosa diplotricha* introduction in to the study area.

3.3. Impacts of *Mimosa Diplotricha*

Almost all of the respondents (98.6%) reported that *Mimosa diplotricha* as having no benefit. Only one respondent reported *Mimosa diplotricha* used as food for bees during flowering time (Table 2).

Table 2. Respondents statement about the benefit of *Mimosa diplotricha* in the study area.

		Frequency	Percent	Cumulative Percent
Valid	Yes	1	1.4	1.4
	No	71	98.6	100.0
	Total	72	100.0	

As shown fig. 5, 47.2% of the respondents reported that *Mimosa diplotricha* as having direct effect on the economy, 37.5% having indirect effect, 4.2% as having no effect, and 11.1% as having both direct and indirect effect on the economy. As to the detailed harm caused by *Mimosa diplotricha*, most of the respondents stated that *Mimosa diplotricha* as causing human and animal injury, affecting biodiversity and causing injures to organisms and blocking main road. Thus, *Mimosa diplotricha* has caused so many problems to the society and biodiversity at large.

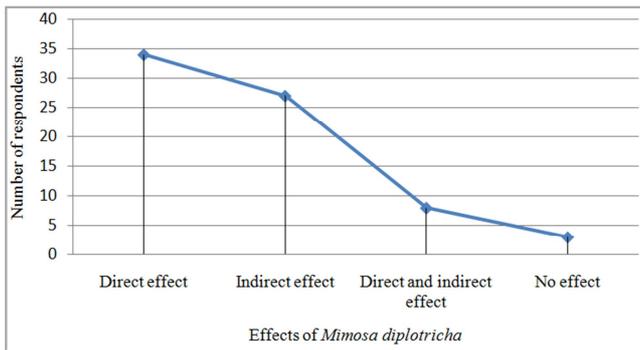


Fig. 5. The economic challenge caused by *Mimosa diplotricha* in the study area.

Most of the respondents (80.6%) informed that *Mimosa diplotricha* as having an inclusive impact on biodiversity, 2.8% as having no impact on biodiversity and 16.7% of them gave no information about the impacts of *Mimosa diplotricha* on biodiversity.

Table 3. The negative impact of *Mimosa diplotricha* on Biodiversity in the study area.

Impacts	Frequency	Percent	Cumulative Percent
Valid	Has an inclusive impact	58	80.6
	Has not impact	2	2.8
	I do not know	12	16.7
Total	72	100.0	

Fig. 6 revealed the negative impacts of *Mimosa diplotricha* in the future. Out of the total respondents 1.4% informed that the negative impact of *Mimosa diplotricha* in the future as mild, 4.2%as moderate, 51.4% as high and 43.1% as very high. Almost all of the respondents (94.5%) informed that the

negative impacts of *Mimosa diplotricha* in the future as high and very high. Other study on the Distribution and Problems of the Invasive Alien Plant, *Mimosa diplotricha* C. Wright ex Sauvalle in Nigeria by [2] has been reported almost similar result.

Table 4. Measure of whether *Mimosa diplotricha* gets out of control or not in the study area.

		Frequency	Percent	Cumulative Percent
Valid	Yes	44	61.1	61.1
	No	28	38.9	100.0
	Total	72	100.0	

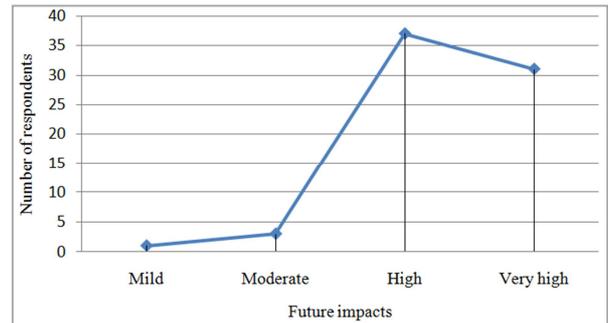


Fig. 6. Evaluation of the negative impact of *Mimosa diplotricha* in the future in the study area.

3.4. Distribution of *Mimosa Diplotricha* in the Study Area

Table 4 Summarized whether *Mimosa diplotricha* gets out of control or not in the study areas. Out of the total respondents, 61.1% informed *Mimosa diplotricha* is getting out of control whereas 38.9% reported that *Mimosa diplotricha* is not getting out of control in the study area.

Almost all of the respondents (97.2%) informed that the roadside as the area which was mostly invaded by *Mimosa diplotricha* while only 2.8% them reported as road side, farmland, forage land and home gardens was invaded by *Mimosa diplotricha*. Study conducted on an invasive alien weed giant sensitive plant (*Mimosa diplotricha* Sauvalle) by [5] also reported almost similar result.

3.5. The Management Practices to Control *Mimosa diplotricha* in the Study Area

Table 5 summarized the organization that has been working on control of *Mimosa diplotricha*. Almost all of the respondents (95.8%) confirmed that there was no organization that has been working on control of *Mimosa diplotricha*. Only 4.2% of the respondents told that there was some organization that has been working on control of *Mimosa diplotricha* such as road transports (Table 5).

Table 5. Respondents Statements about the existence of Organization that has been working on control of *Mimosa diplotricha* in the study area.

		Frequency	Percent	Cumulative Percent
Valid	Yes	3	4.2	4.2
	No	69	95.8	100.0
	Total	72	100.0	

Almost all of the respondents informed that there was no effective action taken to control *Mimosa diplotricha* in the study area and majority of them believed the government, the communities and the non- governmental organization should be working together in order to control the spread of *Mimosa diplotricha*.

4. Conclusions and Recommendation

Many alien species are introduced deliberately for various intended purposes. Nevertheless, a lot of risk is associated with the introduction of new species. The knowledge base on IAS control options is limited. This has resulted in numerous problems experienced only after being invaded by alien species, which do not seem to have an easy solution. Introduction of *Mimosa diplotricha* has now become problematic as it invades on natural areas. Currently, *Mimosa diplotricha* was invading the roadsides and the farmland and home garden of Shebe-sombo, Kersa and Seka-chekorsa districts, Jimma Zone, Oromiya region, Southwestern Ethiopia. This assessment study indicates the severity of the invasion in these areas. Therefore, there is a need of better planning to control, manage and eradicate the spread of *Mimosa diplotricha* by establishing communication links between Regional, Zonal, district and *Kebele* Agricultural Office. In addition to this, strong local support and commitment from the government and individuals will more likely facilitate in the control, management and/or eradication of *Mimosa diplotricha* on private land.

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