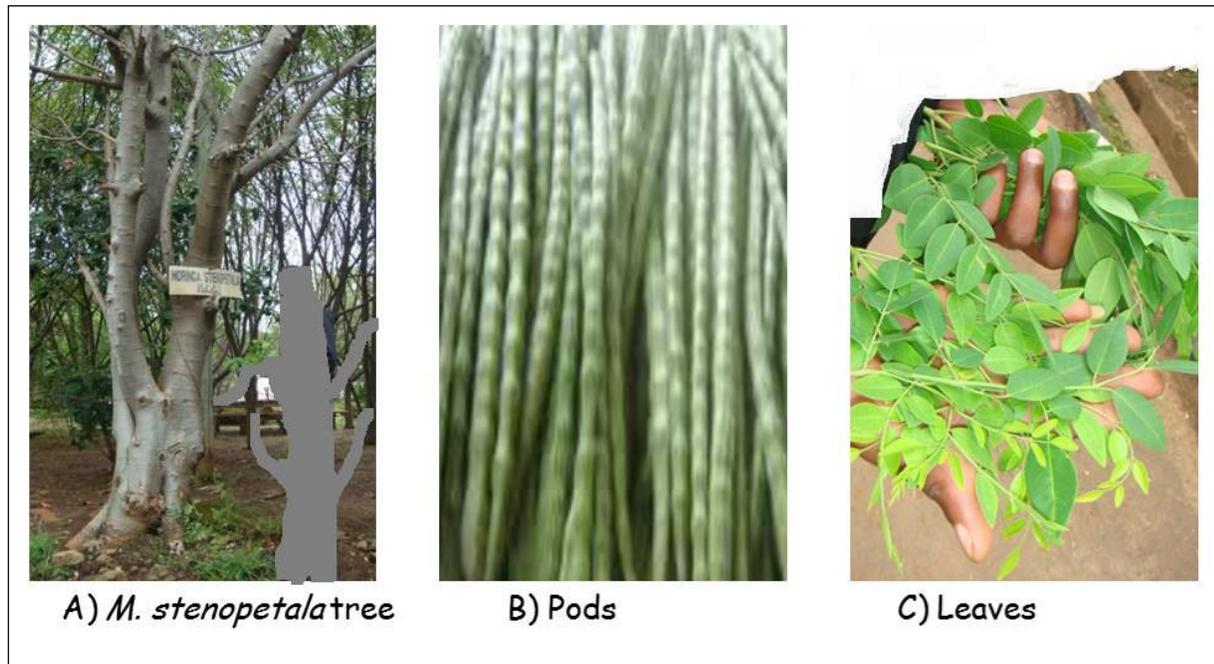




The Ethiopian Public Health Institute



Proceeding of the Consultative Workshop on *Moringa stenopetala* to maximize its potential use



Prepared by: Ashenif Tadele (B Pharm, MSc), AsfawDebella, PhD

Proceeding of Consultative Workshop on Moringa stenopetala to Maximize Its Potential Uses



This proceeding summarizes the consultative workshop on *Moringa stenopetala* to maximize its potential use, held in May 22 – 23 of 2014, in Bishoftu, Ethiopia. The workshop was made possible due to the unreserved follow-up from the initiation to commencement by Dr. Yibeltal Assefa, (Deputy Director General of EPHI).

Prepared by: AshenifTadele (B Pharm, MSc), AsfawDebella(PhD)

Edited by Task Force Members for *Moinga*

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Acronyms

AAU	Addis Ababa University
ANOVA	Analysis Of Variance
DM	Diabetes Mellitus
EBI	Ethiopian Biodiversity Institute
EOC	Essential Oil Content
EPHI	Ethiopian Public Health Institute
FMHACA	Food, Medicine and Health Care Administration and Control
FSNRD	Food Science and Nutrition Research Directorate
HoA-REC&N	Horn of Africa Regional Environment Centre and Network, Addis Ababa University
MIC	Minimum Inhibitory Concentration
NCD	Non Communicable Disease
OR	Odds Ratio
QC	Quality Control
SEDA	Sustainable Environment and Development Action
SERO	Scientific and Ethical Review Office
SOP	School Of Pharmacy
SPM	Strategic Planning Management
SPSS	Statistical Package for Social Sciences
TLC	Thin Layer Chromatography
TM	Traditional medicine
TMMRD	Traditional and Modern Medicine Research Directorate
WGARC	Wondo Genet Agricultural Research Center
WHO	World Health Organization

Welcome address

- Dear Dr. **Yibeltal Assefa, Deputy Director General-Research & Technology transfer, EPHI**
- Honorable invited guests, partners and participants,

First of all I would like to welcome you all in this consultative workshop on reviewing the research efforts of *Moringa stenopetala* commonly known as “Sheferaw or Aleko”

It is indeed a great honor and pleasure for me to see the presence of Dear Dr. YibeltalAssefa, DDG-Research & Technology transfer and honorable invited guests and contributors of from various institutions considering the importance of this occasion from their busy time.

It is also my great pleasure in this opportunity to express my appreciation and gratitude on behalf of the organizing committee to the workshop participants for sharing the information on indigenous use and research based data on the plant leading to ideas exchange for setting directions among interdisciplinary experts, knowledgeable community elders and other concerned bodies

May I now take this opportunity to invite Dr. Yibeltal Assefa, **Deputy Director** General of EPHI to the stage to make keynote addresses and officially open the workshop.

Thank you!

Asfaw Debella PhD, Workshop organizer
Director, Traditional and Modern Medicine Research Directorate, EPHI

Key note and opening address

Dear Invited guests, ladies and gentlemen

First of all I would like to welcome you all to this workshop.

It is indeed a great honor and pleasure for me to be present in this consultative workshop on reviewing the research efforts of *Moringa stenopetala* commonly known as “Sheferaw or Aleko” and setting future directions for maximizing its potential beneficial effects through collaborative efforts of all stakeholders.

Dear Colleagues and Participants,

As you all know *Moringa stenopetala* commonly known as Shiferaw is a very popular plant having multipurpose property. Although fragmented and unorganized a number of research works were undertaken by various investigators to characterize the nutritional, medicinal and other importance besides investigating its deleterious or undesired effects on health.

The current trends of high promotion of *Moringa* or Shiferaw as a miracle plant led to its massive utilization and inflated price in the market, this may pose a problem of adulteration with cheap materials that could have undesired effect on health. The consultative workshop on *Moringa* creates a good forum for sharing information on indigenous use and research based data on the plant leading to ideas exchange for setting directions among interdisciplinary experts, knowledgeable community elders and other concerned bodies

Coming to the two days deliberation and discussion sessions, participants are expected to review the scientific evidences on Sheferaw to provide standardized information on its safe use for the public besides identifying the knowledge gap in order to address through multidisciplinary research efforts. The participants are also expected to set future direction on common understandings to maximize the potential benefits of the plant.

I would like to acknowledge the efforts of all the contributors and organizers for the success of this consultative forum.

Wishing you a fruitful deliberations.

I thank you all.

Yibelta IAssefa, MD, MSc, PhD,, DDG-Research & Technology transfer, EPHI

Objectives and Importance of the Workshop

Moringa stenopetala is used as food and traditionally to treat different ailments. However, there is over promotion and inappropriate use of the plant that leads to complication of health of the community. This is due to the weak regulatory system of the country and lack of coordinated research works. Moreover, coordinated works have become mandatory in major areas like regulation, maximizing the beneficial use of the plant, creating a value chain from the producers to the customers and conservation of the plant materials as well as the genetic resource.

Hence, emphasis needs to be focused on maximizing the beneficial use of the *M. stenopetala* by producing *Moringa* based nutrition and drugs. This can be achieved by creating a platform on reviewing, documenting standardized information on the indigenous use and scientific evidences of *M. stenopetala*, identify the knowledge gap and sensitize and create awareness the community on the safe use of *M. stenopetala*.

Topics Discussed

- Scientific research findings on the medicinal and nutritional profile of *M. stenopetala*.
- Regulatory aspects of medicinal plants
- Ethnobotany, Conservation, sustainable use and creating value chain to maximize the potential use
- Agroforestry aspect of the plant
- Challenges and opportunities in maximizing the potential use of the plant
- The way forward and recommendation points

OUTCOME

The knowledge gained from the experiences of the invited resource persons can be utilized to understand various challenges and opportunities in maximizing the potential use of *M. stenopetalaso* that there could be a coordinated research efforts and preparation of standardized information to sensitize and create awareness for the community on the safe use of *M. stenopetala*.

Executive summary

This consultative workshop was organized collaboratively by the Directorates of Traditional and Modern Medicine and Food Science and Nutrition Research of the Ethiopian Public Health Institute (EPHI) and conducted in Bisheftu from 22 to 23 May 2014. The objectives of the workshop were to create a platform for reviewing and documenting standardized information on the indigenous use and scientific evidences of *M. stenopetala*, and identify the knowledge gap; to sensitize and create awareness of the community on the safe use of *M. stenopetala* based on the standardized information about the plant; to set future directions in maximizing the potential benefits the plant.

A total of 66 participants attended the workshop. The participants were from EPHI, knowledgeable community leaders from Konso and Hammer communities, academicians and researchers from various colleges and research centers of Universities, St. Paulo's Millennium Medical College, Ethiopian Biodiversity Institute, Ethiopian Institute of Agricultural Research, Horn of Africa Regional Environment Centre / Network-Addis Ababa University, Wondo Gonet Agricultural Aromatic Research Centre on aromatic and medicinal plant within Ethiopian Institute of Agricultural Research, Food, Medicine, Health Administration and Control Authority as well as NGOs dealing with Sustainable Environment and Development Action, processed *M. stenopetala* entrepreneurs & cultivators and other invited experts.

A total of 15 scientific papers were presented on indigenous use, ethnobotany and agro-forestry of medicinal and nutritional values of *Moringa Stenopetala* as well as *its* chain for food security and improved livelihoods of small holder farmers, quality control and regularity requirement aspects. The meeting pointed out the knowledge gap, opportunities and challenges, value chain and road map to maximize its potential benefits for the community and emphasized on the following:

1. The need for multidisciplinary, coordinated and focused research to validate the traditional claim on *M. stenopetala*.
2. Collaboration of biomedical and agricultural researchers has paramount importance and need to be further strengthened for the conservation, propagation, cultivation and sustainable use through development of affordable and validated *M. stenopetala* products.
3. The need to create linkage with food processing industry and pharmaceuticals manufacturers for value chain development through research collaboration and capacitate all the stake holders for stick to good agricultural practice (GAP) good manufacturing practice (GMP).
4. A regulation mechanism should be in place for controlling the undue promotion, quality, certification and standardization of the plant/parts and suppliers.
5. Information on indigenous knowledge and scientific data so far generated on *M. stenopetala* should be compiled and systematically analyzed and standardized information on *M. stenopetala* be disseminated to the public. The information to be disseminated on *M. stenopetala* could need to be categorized as those to be promoted or prohibited considering the risk Vs benefit ratio.
6. The need for establishing *M. stenopetala* task force to create linkage and coordinate the overall activities conducted by different stakeholders pertaining to *M. stenopetala*
 - Proposed Institutions for membership of *M. stenopetala* task force include Ethiopian Public Health Institute (EPHI) Chair, Horn of Africa Regional Environment Centre and Network, Addis Ababa University, (HoA-REC&N) Secretary, Ethiopian Food, Medicine & Health Administration and Control Authority (EFMHACA), Ethiopian Biodiversity Institute (EBI) and Ethiopian Institute of Agricultural Research, Department of Pharmacology, School of Medicine, College of Health Sciences, Addis Ababa University, Faculty of Life Science, College of Natural and computational Sciences, Addis Ababa University, Ethiopian Environment Development Organization, Knowledgeable community elder from Indigenous people where *Moringa* indigenous knowledge could be accessed

ABSTRACTS FOR ORAL PRESENTATION

Indigenous use of *Moringa stenopetala* by the community of Konso and Hammer

Kora Garra, Community Elder from Konso

Abstract

Moringa stenopetala locally known as Shiferaw (Amharic), Halako (GamoGofa), Shelaqta (Konso), Haleko (Derashe) and Cabbage Tree (English) among local communities in southern Ethiopia. It is cultivated in farm and backyard in village. In konso people have well organized and adaptable agro-forestry farming to the existing dry climatic condition. In konso *M stenopetala* are part of the cultivation system, over 500 people/km² can be self-sufficient in food security when compared 50 people/km² under ox farming which are permanently under food aid despite one step ahead in development stage. The local community of konso and Hamer, *M stenopetala* is a multipurpose tree cultivated as a living hedge and wind breaks to reduce the rate of erosion, It is grown as a vegetable tree and medicinal plant, Edible leaves, young fruits and roots are eaten, Thus it could play a much more important role in nourishment of people and in sustainable use of the environment, Local people use boiled leaves as tea or chopped and mixed it with water to treat malaria, hypertension, stomach problems, expulsion of retained placenta and in some other problems like asthma and diabetes. However, the leaves of the plant is eaten by caterpillar, stem borer and problem of storage without taste change. Therefore, prevention mechanism should be in place to avoid economical loss of the farmers and strengthen the research activities to validate the traditional claims for maximization of the potential use of *M stenopetala*.

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Overview on Ethnobotany of *Moringa stenopetala* and Access and Benefit sharing (ABS)

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Abstract

The relationship between human beings and plants has a long history. Since antiquity human uses plants for several purposes. Ethno-botanical study of traditional plant knowledge has resulted in many valuable discoveries, ranging from new methods for cultivating crops on arid lands to new medicines for the treatment of disease. Ethno-botanical research has led to the development of many commercial plant-derived drugs. *Moringa stenopetala* (Bak. f.) Cuf. (1957) belongs to family Moringaceae and to the genus *Moringa*. The genus is the only genus in the family which is represented by 14 species. Northeast tropical Africa is a center of endemism and diversity to the genus *Moringa*. Among these 14 species, six species including *M. stenopetala* and *M. oleifera* Lam. absolutely recorded with 2 others expected to be found in Ethiopia. Though, *Moringa* tree (*M. stenopetala* and *M. oleifera*) is known by their common names Cabbage tree and Horse Radish tree respectively; based on the multipurpose behavior of the trees several impressive bynames has been given to them such as "The Tree of Life", "The Never Die Tree", "The Magic Tree", "The Tree of Paradise", "The Miracle Tree" and "Mothers' Best Friend". In Ethiopia, *Moringa* is known by different vernacular names such as Shferaw (Amharinya), Aleko, Aluko, Halaco, Halako (Gamonya), Kallanki (Benninya), Telahu (Tsema), Haleko, Shelchada (Konsonya), Wuame, Mawe (Somalinya) and others. The Genus *Moringa* follows the distribution pathway from Rajasthan to south West Africa (Africa, Madagascar and parts of Asia, including Arabia and India), whereas *M. stenopetala* native to Ethiopia and Kenya, historically originated from Ethiopia. In Ethiopia it is cultivated in terraced fields, gardens and small towns, also growing naturally in riverine and *Acacia-Commiphora* woodland and on rocky ground (though it is now either extinct if not diminished from time to time in the wild) from 1200-1650 m. in Kafa, Gamogofa and Sidamo floristic regions, also in the northern part of Kenya. It is a multi-purpose tree producing edible leaves which are boiled and eaten like cabbage. In Ethiopia the fresh or processed leaves are sold in local markets which are used as food supplement with high nutritional value and for its impressive range of medicinal uses. The seeds can be used to purify water. Since the two species are closely related it is believed that (and also ascertained by experiment for some of them), *M. stenopetala* may also have such properties and more others. These important ethnobotanical knowledge are mostly based on the indigenous (traditional) knowledge (IK) which is transferred from generation to generation orally and is seldom documented. Scientists are often adapting IK and reapplying it in projects of contemporary contexts. Therefore, it can be considered that IK and modern science can be seen as two systems of knowledge that complement each other. However, the fact that indigenous people have seldom shared in the profits gained from ethno-botanically derived drugs has made them to be suspicious or

distrustful of sharing information with researchers. Protecting the intellectual property rights (IPR) of indigenous people, as well as determining how they can and should be compensated, is of growing concern. This and other related reasons has led to the development of international treaties, conventions and protocols which deal with the access of genetic resources and equitable sharing of the benefits from the commercial utilization of the resource, such as Convention on Biological Diversity (CBD), International Treaty on Plant Genetic Resources for Food and Agriculture (ITPGRFA), the Nagoya Protocol on Access and Benefit-Sharing, the Bonn Guideline on Access and Benefit-Sharing and the African Model Law for the Protection of the Rights of Local Communities, Farmers and Breeders, and for the Regulation of Access to Biological Resource in Relation to International Law and Institutions. Based on such conventions Ethiopia has also developed her own proclamations and regulations such as Access to Genetic Resources and Community Knowledge, and Community Rights Proclamation (No. 482/2006) and Regulation (No. 169/2009) which should be implemented to access genetic resources and traditional (community) knowledge and ensures the access giving community or country to have an equitable share of the benefit from the utilization of the resources and knowledge. Therefore, local communities, scientific community and other stakeholders working on the IK and genetic resources should be aware of such proclamations and regulations and obey to them before accessing the resources and knowledge in order to benefit the community who has conserved the resources and the knowledge for many centuries.

Agroforestry aspect and its influence for sustainable higher yield and quality of *Moringa stenopetala*

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Abstract

Ethiopia has a land cover mass of 6, 28 and 66 percent high, mid and low land cover. The highland is characterized by cold temperature predominantly a mixed farming agri-silvo-pastoral system that further expands to mid land. The farming system predominantly produce annual crops of shallow rooted cereals that depleted soil nutrient and remain in bare prior to sawing the exposes top fertile soil so wind and water physical erosion. To the contrary perennial common traditional on farm plant such croton in the north, *Acacia albida* in the central Rift Valley and adjacent lands, *Albizia species* in coffee growing area in the West last but the most important *Moringa stenopetala* the most important multipurpose food, feed and environmental conserver grows even in harsh sites which is characterized by repeated drought. In the South where *M stenopetala* is originated and expanded as a cultivar by farmers. Moisture deficient the majority of the low land and part of mid land except the western part and riparian strips, which is a *Moringa* growing potential area has low rain thus the farmers are predominantly pastoralists. This area ranges from the periphery on one hand and the Rift Valley to elevating to 1900m. With the exclusion of frost pockets and termite prone site the remaining 75 per cent of the land cover is a *Moringa* growing potential area both under rain fed and irrigation. Being perennial it sustained carbon sequestration, food and feed supply where most perennial plant becomes leafless and fail to do so. Currently under research finding high yielding of better quality improved local species is on the virtue of realizing to farmers. Current research finding compares different cereals, vegetables and pulses comparative study with moringa mixed cropping and *Acatiaalbida/Faidertiaalbida* (currently accepted as a number one on farm tree by the World Agro-forestry scientists) tree intercrop with a hedge raw of *Moringa* in which all other crops both light demanding and shed tolerant are mixed and produced. The research compared with the worldwide popular Indian origin improved *Moringa oleifera* and has shown superiority in most character such as nutrient content, yield, drought and salinity tolerance. The ultimate result is in which options are a farmer better of in small area of home garden size of land is a result. So far *Moringa* in mix and in sole proved to be superior over other crops however evaluated at research level.

Overview on the studies undertaken on the medicinal values of *Moringastenopetala* and future directions

Prof. Yalemtehay Mekonnen,

College of Natural and computational sciences, Addis Ababa University

Abstract

The Genus *Moringa* Forsk. belongs to Family Moringaceae with 14 species. All varieties contain strong, mustard-like taste. The stems produce gum and the seeds are rich in oil. *Moringa stenopetala* (Baker f.) Cufodontis (*Aleko, Shelkata*) is the dominant species in Ethiopia with multipurpose use. The medicinal values of *M. stenopetala* can be summarized as follows.

Anti-microbial effects: *M.stenopetala* was also proved to have antibacterial effect. **Antiparasitic Property:** the ethanolic extract of fresh root wood ethanol and the acetone extract of the dried leaves showed activity against *Trypanoso mabrucei* . The ethanol extract of fresh *M. stenopetala* leaves showed some **anti-fertility property** in laboratory albino mice. In vitro, leaf ethanol extract showed some oxytocic-like activity in guinea pigs and mouse uteri. **Hypotensive, hypocholesterolemic and hypoglycemic effects:** The water extracts of the leaves in guinea pigs demonstrated hypotensive propert. Serum glucose level and serum cholesterol level were significantly decreased after six weeks of treatment of mice with the aqueous extract of the leaves of *M. stenopetala*. Its hypoglycemic effect in guinea pigs was also reported. **Water flocculating property:** *Moringa* seeds are used to clear dirty and muddy water thus having aseptic property in combating disease causing organisms.

In light of the wide use of *M. stenopetala* in particular in southern parts of Ethiopia, it can be properly exploited as a food supplement with good manufacturing practice (GMP). Furthermore, after formulation of the active constituents and stepwise clinical trials, the *Moringa* product could be made available as traditional medicine complementing modern drug supplies. To realize these benefits concerted effort of different entities has a paramount importance.

Key words *Moringa stenopetala*, anti-microbial, hypotensive, hypoglycaemic, hypocholesterolemic

Review on the effects of *Moringa stenopetala* leaves on Hypertension

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Ethiopian Public Health Institute

Abstract

Background: Non-communicable diseases caused two thirds of all deaths globally; about 36million deaths in 2008. Nearly 80% of deaths are occurred in low-and middle-income countries. Cardiovascular disease is leading cause mortality in non- communicable diseases, contributes 17million deaths (48% of NCD deaths) a year. Hypertension affects around one billion people worldwide and 10% of the global disease burden. In Ethiopia, hypertension is 12th top killing disease. Several modern antihypertensive medications are available thus far, but expensive, side effects and unpalatable due to polypharmacy. Various herbal preparations have been used and claimed to have benefit for hypertension in the folk medicine such as *M stenopetala*.

Objective: Review on the effects of *Moringa stenopetala* leaves on Hypertension

Methods and materials: The plants used in this study were collected from wild and authenticated, dried under shade and crushed to powder and the aqueous; hydroalcoholic and solvent fractions were prepared for subsequent laboratory experiments. The diuretic, hypotensive and vasodilatory activities were conducted using different model. Experimental animals were randomly allocated to the treatment group, the control and reference group. After administration of the sample, the experimental animals were placed on a metabolic cage. The urine were collected in measuring cylinder up to 5hrs after dosing and compared with standard diuretic agent, Furosemide (10mg/kg body weight). The saluretic potential of the different extract was measured based on Na⁺, K⁺, Cl⁻, Na⁺/K⁺. Hypotensive activity was evaluated by IV infusion of *M stenopetala* on normotensive rats using BP analyzer. Vaso-relaxant effects of the different extracts were conducted on guinea pigs thoracic aorta by reversing the vasoconstriction activity of KCl using Organ bath and Polygraph. Results were expressed as means ± standard errors of means.

Results: The aqueous extract of *M stenopetala* showed lowering the SBP, MABP and DBP at 5, 10, 20, 30 and 40mg/kg IV infusion on anesthetized normo-tensive guinea pigs. The same extract also showed an increase in vaso-relaxant effect to 95.56% by cumulative addition of the extracts to a dose of 7 mg/kg after vasoconstriction induction using KCl (80mM). Diuretic activity of different fractions of *M stenopetala* in swiss albino mice showed that 50mg/kg of 70% ethanol extract (1.33), 50mg/kg of the n-butanol fraction (1.44), and 150 mg/kg of the aqueous fraction (1.17) showed more diuretic activity than Furosemide (10mg/kg). In the meantime, the saluretic potential of the different extract and doses of *M stenopetala* on Na⁺, K⁺, Cl⁻, Na⁺/K⁺ is very significant. Diuretic evaluation of the tea simulation of fine and coarse powder of the *M stenopetala* done in 2, 4 and 6 tea spoon showed better diuretic activity than the standard drug Furosemide (10 mg/kg).

Conclusions and Recommendation: The study validates the claimed antihypertensive uses of this medicinal plant in folk medicine. *M. stenopetala* showed a promising efficacy (*in-vitro* and *in-vivo*) against hypertension on the experimental animals. The herbal tea preparation requires standardization of the tea preparation. Further in-depth pharmacodynamic and pharmacokinetic studies using different models and techniques are mandatory to have a data complete that helps to promote a rational community use of *M. stenopetala*.

A review on the effects of *Moringa stenopetala* leaves on diabetes

Alemayehu Toma, Eyasu Makonnen, Yalemtehay Mekonnen, Asfaw Debella, Sirichai

Addiskwattaana

Abstract

Background: Worldwide, the number of people with diabetes and pre-diabetes is exponentially increasing mainly due to aging, urbanization, unhealthy eating habits, increasing prevalence of obesity and lack of physical activity. *Diabetes mellitus* is a leading cause of morbidity and mortality worldwide, with an estimated 382 million adults being affected and 5.1 million people killed in the year 2013. The prevalence is expected to be 592 million in the year 2035, with the greatest increases expected in low- and middle-income developing countries of the African, Asian, and South American regions. At present, 80% of the worlds' populations with diabetes live in low- and middle income countries.

Review: *M stenopetala* (Baker f) *Cufodontis* belongs to family Moringaceae is commonly grown in Southern parts of Ethiopia. The leaves of *M stenopetala* are cooked and eaten as vegetables and the leaves and roots are used to treat malaria, diabetes, asthma, repelled placenta, hypertension and gastrointestinal problems. The crude aqueous extract of the leaves demonstrated hypoglycemic activity. The crude aqueous/ethanol extract and fractions of the leaves of *M stenopetala* have been reported to have both hypoglycemic and anti-hyperglycemic effect. Moreover, chronic administration of the n-butanol fraction of ethanol extract of *M stenopetala* leaves in alloxan-induced diabetic mice showed anti-hyperglycemic and anti-hyperlipidemic effects with wide margins of safety, indicating its potential for long term management of diabetes. The chromatographic fractions of ethanol extract of *M stenopetala* leaves also should anti-hyperglycemic effect.

Conclusions: *Moringa stenopetala* has hypoglycemic, anti-hyperglycemic and anti-hyperlipidemic effects with wider safety margins. Anti-hyperglycemic and anti-hyperlipidemic effects could be associated with inhibition intestinal and pancreatic enzymes.

The Antibacterial activity and water clarifying property of *Moringa stenopetala* seed extracts

Hirut lemma, Christina Haile, Redwon Muzain, Negero Gemedo, Getachew Addis, Mulugeta Guta, Frehiwot Teka, Kirubel Tesfaye, Aynalem Lakew, Kidist Yirsaw, Asfaw Debella; Ethiopian Public Health Institute

Abstract

Background: *Moringa stenopetala* – A branched tree that grows 6-10m tall. It grows abundantly in south western Ethiopia. It is known by different vernacular names such as shiferaw, Aleko and cabbage tree. *M. stenopetala* is known in folk medicine as having value in treating a wide variety of ailments. Among 14 species of moringa tree, *M. oleifera* is well studied with regard to potential medicinal uses and the identification of compound of potential therapeutic importance which is native to India.

Objective: To investigate the Antibacterial activity of extracts and Evaluate the efficacy of optimum concentration of *M. stenopetala* for water clarifying activity and to develop appropriate dosage form for water clarifying agent from *M. stenopetala* seeds.

Methodology: The seeds of the plant were collected from Arbaminch where it is widely cultivated. A voucher specimen was identified by taxonomists and deposited at TMDRD in EPHI. The seeds were air dried and then powdered for extraction. Powdered seeds were defatted with petroleum ether. Defatted marc was then extracted with 70% ethanol. The aqueous extract was macerated with distilled water, filtered and freeze dried using lyophilizes. The Anti-bacterial activity was determined by using both Agar well diffusion and Agar dilution method. The Optimum concentration of *M. stenopetala* for water clarifying activity was also conducted and the comprehensive physico-chemical and microbiological analysis moringa treated water was studied

Results: Both the petroleum (5, 10, 20, 40%) and ethanol (5, 10, 25, 50 and 100 mg/ml) and aqueous (5, 10, 25, 50 and 100 mg/ml) extract of the plant did not show any zone of inhibition against standard and clinical strains of E coli, Salmonella, and shigella. Serial agar dilution of pet ether (0.5-8%), both ethanol and aqueous extract (0.25-4mg/ml) of the seeds didn't show activity against the above test organisms. More over the contaminated water treated with the optimum concentration of extract (62.5mg/ml) didn't show any effect on physicochemical and microbiological quality of the water

Conclusions and Recommendations: From this study the result of different extracts of *M. stenopetala* seed didn't show antibacterial activities. The optimized concentration of extract (62.5mg/250ml) didn't have any effect on physicochemical and microbiological analysis of treated water. The aqueous extract of seeds works as a flocculent by binding the bacteria to the solids in water and causing them to sink to the bottom but additional treatment of filtering and boiling of water is needed to render it completely safe to drink. So, there is a need to study other dosage forms.

Effect of Moringa stenopetala powdered leaves in mitigating ingested fluoride

Aweke kebede^{1*}, Nigussie Retta², Cherinet Abuye¹, Marian Malde³, Melkitu Kassaw¹, Tefaye Zeru¹, Meseret W/ Yohannes¹

Abstract

Excessive intake of fluoride is accompanied by a characteristic sequence of changes in teeth, bone and periarticular tissues. These changes lead to a variable degree of locomotor disability, ranging from simple mechanical back pain to severe, crippling and neurological impairment. Fluorosis is an important clinical and public health problem in several parts of the world. Fluoride is mainly absorbed in the stomach and small intestine. Over 75% of ingested fluoride is absorbed. Fluoride absorption can be altered by dietary calcium which forms insoluble complex. The objective of this study is to assess the effect of Calcium or calcium rich food (*Moringa* dry leaf) supplementation to reduce amount of absorbed fluoride. The level of mitigation of ingested fluoride is monitored using urinary and fecal fluoride level. The trial is conducted on rats (albuino wistar) and willing women. The results show that supplementation of calcium or *Moringa* in daily ration will reduce urinary fluoride and increases fecal fluoride level. There is no significant difference between *Moringa*, calcium tablet or milk in reducing urinary fluoride level. Using *Moringa* to mitigate ingested fluoride has additional benefit of vitamins and minerals.

Key words: *Moringa stenopetala*, Fluoride, Fluorosis

Toxicological studies of n-butanol fraction of *Moringa stenopetala* leaves in rats

Abdu Hassen, Dilla University

Abstract

Background: Medicinal plants are used to prevent and treat a great variety of human diseases due to their constituent of alkaloids, glycosides, polyphenols etc. *Moringa stenopetala*, which is found in the Southern parts of Ethiopia, contains the primary metabolites such as carbohydrates, proteins, fats, vitamins, and minerals and secondary metabolites/phytomolecules: alkaloids, flavonoids, glycosides, polyphenols, saponins, sugars, steroids, and others. The leaves of *M. stenopetala* are eaten as vegetable and traditionally for the treatment of various ailments such as Malaria, hypertension, asthma, diabetes, stomach pain, and other diseases. Despite their therapeutic values, toxicity studies of the leaves were limited. The aim of the study was to investigate the acute and sub-chronic toxic effects of n-butanol fraction of the leaves on Behavior and body weight, Hematological and biochemical parameters, Gross and histopathology of the liver and kidneys in rats.

Materials and Methods: The plant leaves were collected from Arbaminch. After drying under shade the hydro-alcoholic extract was prepared followed by n-butanol fraction. The acute toxicity at four different doses (500, 1000, 2000 and 5000 mg/kg) and sub-chronic toxicity at two different doses (500 and 1000 mg/kg) were conducted on both sexes of the albino rats according to OECD guidelines. Blood samples were collected by cardiac puncture for analysing haematological and biochemical parameters. Gross pathological observation was conducted on the Liver and the kidneys after sacrificing the rat at the end of the experiment. Data analysis was performed using the SPSS version 20 program, with One-way analysis of variance (ANOVA) followed by Dunnett's t-test. Values were expressed as Mean \pm SEM. $P < 0.05$ were considered statistically significant.

Results: The acute toxicity study indicated that no significant ($p > 0.05$) body weight changes, no death and apparent behavioral changes and no gross pathological lesions up to a dose of 5000 mg/kg of the fraction. The sub-chronic toxicity study also showed that no significant changes were observed in both test groups as compared with the controls on the hematology and biochemical parameters. However, the blood glucose level decreased significantly by 23 and 21% at the dose of 500 and 1000 mg/kg; respectively ($p < 0.05$). Histology of the liver and kidney showed that the fraction was non-toxic to the cellular structures of the liver and kidneys.

Conclusion and Recommendations: The fraction was well tolerated up to an oral dose of 5000 mg/kg and does not produce have undue effects on the behavior, body weight, blood parameters and on the gross and histopathology of the liver and kidneys. Further sub-chronic and chronic toxicity studies should be carried out in other animal species such as guinea pigs, rabbits, and dogs. Furthermore, detailed sub-chronic and chronic toxicity studies should be carried out on other organs such as the stomach, intestine, pancreas, and thyroid gland.

Developing Moringa value chain for food security and improved livelihoods of small holder farmers in Central Rift Valley (CRV) and South Omo: opportunities, constraints and prospects

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Addis Ababa Ethiopia.

Abstract

The multipurpose tree, *Moringa stenopetala* (Bak.f.)Cufod, has been restricted until recently to a few areas of the Southern Nations, Nationalities and Peoples Regional State (SNNPRS). However, it has become one of the vastly growing and traded commodities in other parts of the country. Owing to the perceived medicinal and nutritional benefits the plant provides, the consumption of its leaves both in powder or dried form has been mounting; production is expanding and new business are flourishing. The private sector including the small and informal businesses is likely to dominate the emerging markets. Many investors have shown interest in establishing value chains for the tree produce. However, lack of organized market chain, proper promotion and public awareness on the use and benefits of the tree have constrained the market potential. Added to this, the absence or weak regulatory and monitoring systems have made the market vulnerable to fraud, escalating the potential risks associated with the use of the tree produce for medicinal purposes. There is inadequate research on its nutritional and medicinal values, potential environmental and economic benefits. It is on this backdrop that HoA-REC&N took this initiative with the principal objective of developing *Moringa* value chain that can contribute to food security and improved livelihoods of small holder farmers in potential areas of CRV and South Omo Zone. It is assumed that small scale farmers could better be integrated in the emerging and restructured markets through gender sensitive value chain development strategy. This approach can help unlock the adaptation potential of smallholder farmers. Professionalizing informal activities in which rural women are traditionally involved could be a good entry point for intervention. When equipped with adequate information, finances, low-cost technologies and networks, smallholders could take actions that have an influence across the value chain while enhancing market-based adaptation. In this presentation, an overview of the proposed *Moringa* value chain project will be presented. The strategies sought, current trends and achievements in terms of addressing the gaps mainly in awareness creation and promotion will be highlighted. Finally, opportunities, constraints and potential risks associated with the emerging *Moringa* business as well as future prospective will be discussed based on the value chain context and in line with organizational and national priorities.

Nutritional and health benefits of *Moringa stenopetala* edible parts

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Abstract

The search for plant species with high nutritional and medicinal potential has to be intensified to improve the nutritional and health status of the population. Ethiopia is endowed with great biodiversity and the population has access to potentially many underutilized plant species with both nutritional and medicinal benefits. *Moringa stenopetala* is one of most valuable and all-purpose underutilized plants. The plant yields at least five different edibles: leaves, pods, seeds, flower and roots. Besides to the food values, all the edibles provide their own remarkable health benefits. Stimulating utilization of this food plants could open new windows of opportunity beyond increasing food supply and diversity. It might be supposed that a country with pressing food problem would exploit all its available food sources to the fullest, but in Ethiopia's case that is not so. The plant is not utilized to its potential because of lack of scientific support, official promotion, or inclusion in extension program. Therefore, this study attempted to show the nutrient composition and health benefits of different parts of *Mstenopetala*. The protein content of the leaf, pod, flower, seed and root were 28.36, 25.19, 29.93, 40.46 and 4.79% on dry weight basis respectively. In crude fat content the seed was found to be superior (37.9%) while the root was the lowest (0.96%). In the crude fiber content the pod was the highest (20.80%) while the seed kernel was the lowest (5.73%). Ash contents also vary greatly from 4.54% for seed kernel to 18.41% for the leaf. In mineral contents, the leaf was found to be better than other parts with 2869, 54.62, 1.22 and 0.72 mg/100 g, dw, for Ca, Fe, Zn and Cu respectively. The pod and the seed contained 10.64 and 5.64 mg/100 g dw of Fe respectively. The pod and the leaf contained comparable amounts of Zn and Cu to that of the leaf. Essential amino acids of the leaf and the seed were also found in appreciable quantities. The leaf contained from the lowest (17 mg/g protein) sulfur containing amino acids to the highest (80.48 mg/g protein) aromatic amino acids. While the seed contained 14.48 mg/g protein lysine to 60.96 mg/g protein leucine. *In vivo* test of methanol extract of *Moringa* leaves on abdominal tissue fat weight management and lipid profile of blood plasma on mice model have indicated that epididymal and peri-kidney fats have reduced by 41.09 % ($p < 0.01$) and 47.83% ($p < 0.05$), respectively. The high induction of total cholesterol in the blood plasma were also significantly reduced by 12.27 % ($p < 0.01$). Subsequent studies with humans are necessary to confirm the findings of this study. As the nutrient composition of *Moringa* edible parts are higher than other leafy vegetables, they can be good sources of nutrients in dry seasons when other vegetables are scarce.

Nutritional profile of Moringa stenopetala species samples collected in different places in Ethiopia and their comparison with Moringa oleifera species

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Abstract

Among various types of *Moringa* species, *Moringa stenopetala* is native to Ethiopia, Northern Kenya and Eastern Somali and is the most economically important species after *M. oleifera*. *Moringa* tree, well known as Shiferaw or Aleko in Ethiopia, is getting a great popularity although little is studied to understand its nutritional composition. Hence, in this study *M. stenopetala* samples were collected from 19 locations in Ethiopia to generate a national data on its nutritional profile. The fresh green leafy vegetables obtained from farming area in different provinces in Ethiopia were dried and physicochemical analysis was carried out employing standard methods of analysis. The samples collected had a mean value of 8.09%, 28.44%, 0.7%, 11.62%, 12.63%, 38.49%, 274Kcal of moisture, protein, fat, crude fiber, ash, carbohydrate and energy, respectively. Moreover, the samples had a mean value of 54.85 mg/100gm, 1,918 mg/100gm, 2.16 mg/100gm, 0.78 mg/100gm, 381.9 mg/100gm, 2.094 mg/100gm and 214.10 mg/100gm, 27.88 mg/100gm and 126.40µg/g of Fe, Ca, Zn, Cu, P, K, Na, vitamin C and B-Carotene respectively. The mean value of the anti-nutritional factors analyzed – phytate and tannin was 378.44 mg/100gm and 358.89 mg/100gm, respectively. There has been a statistically significant difference in the mean values of all nutrition composition parameters between study regions– Tigray, Amhara, Oromia, SNNPR and Dire Dawa – except for tannin content of the samples. These findings reveal that *M. stenopetala* species of *Moringa* tree in Ethiopia has appreciable nutritional profile which can be of a great input to fight the long overdue malnutrition problem in Ethiopia.

Key words: *M. stenopetala*, nutritional value and anti-nutritional factor

Regulatory Requirements and Quality Control of Herbal medicines

Bikila Feyissa, Director, Product Quality Assessment Directorate, EFMHACA

Background: Regulation is vital for medicines because they are not commodities of ordinary commerce. As a result, there must be evidence based practice and oversight by a competent authority is compulsory. Such a practice requires evidence of safety, quality & efficacy. The general quality and safety criteria for herbal medicines are limits for heavy metals and microbial contamination, absence of steroids and other adulterants, prohibition of herbs with adverse effect as well as compliance to Good Manufacturing Practice. The Ethiopian Food, Medicine and HealthCare Administration and Control Authority (EFMHACA) was reorganized subsequent to the 2008/2009 Health sector reform by establishment regulation number 189/2010 to regulate medicines. The Authority is established to enforce proclamation No. 661/2009 and the subsequent Regulation No.299/2013. The Ethiopian health policy general strategies address issues related to developing quality control capability to assure efficacy and safety of products as well as attention that shall be accorded to traditional medicines use. It also details about identifying and encouraging utilization of beneficial aspects of traditional medicines; coordinating and encouraging research on traditional medicines including its linkage with modern medicine as well as developing appropriate regulation and registration for its practice. The Subsequent drug policy also mentions about facilitating the gradual integration of traditional drugs with modern medicine and favorable conditions shall be created for the application of traditional drugs while safety and efficacy for treatment has to be ascertained as well as encouraging private engagement. Article 13 Sub article 13.1 of the Proclamation 661/2009; affirm that medicine produced locally or imported shall not put in use unless it is duly registered by the executive organ after being tested for its safety, efficacy and quality. This is applicable for traditional medicines and there is also a specific clause for registration of traditional medicines. In addition, article 45 mentions that “Any locally produced or imported traditional, complementary or alternative medicine may not be put into use unless evaluated and registered by the executive organ”.

Capacity of EFMHACA lab & Quality control of Traditional Medicines: Major tests recommended for traditional medicines as per the WHO methods for QC of herbal medicines & other DRA lab experience includes; Different Physicochemical tests, as well as determination of heavy metals (arsenic and toxic metals), microorganisms, pesticide residues, aflatoxins & adulteration. With this regard EFMHACA laboratory has the potential capacity in terms staff & laboratory equipments to do such quality control tests. However, there are gaps regarding test methods and specifications for ensuring quality of such medicines. Hence, this needs collaborative effort with relevant institutions to come up with validated test methods & specifications for domestic herbal medicines. Currently the laboratory is providing toxicology test using lab animals which does not guarantee quality, evidence about adulteration & possibility of chronic toxicity of the traditional medicines

Way forward: EFMHACA has developed guideline for registration of Ethiopian Traditional Medicine which is believed to be endorsed soon. The authority is in the process of strengthening its laboratory so that it can set up chemical & microbiological testing for quality control of such products. Because, it has to provide at least, the crucial quality control tests and respond to the public concern regarding quality & safety of herbal medicines.

Conclusion: Traditional Medicine will contribute to human health care and people have the right of access to traditional medicines/practitioners/ as part of their cultural heritage. However, there are many challenges to ensure safety efficacy & quality as well as effective use of these medicines. Therefore, attention shall be accorded to traditional medicine use but without compromising on quality.

Opportunities and challenges of research, production, promotion of *M stenopetala*

A. Opportunities

- Ability to grow in low land areas with more moisture content
- Easy germination, fast growing, high regeneration capacity, easy for seedling (the seed have wing to fly)
- High productivity
- Perennial vegetable
- Wide area geographical growth
- Favorable condition for cultivation and growth
- Important candidate plant to mitigate the issue of climate change- carbon sequestration, carbon trade--Supportive for green development
- International knowledge and research experience sharing
- Importance in ensuring food security and environmental management in arid and pastoralist area
- Market based imitative
- Good initiation of NGO in seedling distribution
- Chip labored
- All nutrients in one
- Multipurpose
- Easy to manage
- Open for new technology
- Massive coverage (found in different regions of the country)
- Wide therapeutic and nutritional uses
- Drought resistance
- High demand of market
- Vast traditional/endogenous knowledge /Indigenous knowledge
- It is a Genetic resource for the country
- Conducive environment for the public promotion/ Easy to teach people

B. Challenges

- Lack of multi-disciplinary research studies including controversial, herb to drug interactions
- Lack of awareness on its importance by policy makers and communities
- Knowledge gap on sustainable use, access and beneficiaries, safety issue
- Resource limitation to promote to the public
- Destruction of seedlings due to free grazing
- Failure to grow in a frost pocket
- No or weak regulatory framework
- Lack of skilled manpower in regulation

- Adulteration, pesticide and insecticide residue contamination
- Lack of centralized office for Moringa information dissemination which results abuse for any misinformation, exaggerated promotion of its medicinal uses for market driven, no magnifying the negative effect, Mixing up of information for *M. olifera* with *M. stenopetala*
- Hypotensive, hypoglycemic and hypocholesterolemic effect results complicated health effects
- Long term study not yet done
- Lack of standardization, Unknown consumption dose
- No guide line for nutritional use
- No benefit sharing and access
- Over harvesting
- Not having clinical data that supports the pre-clinical study

C. Existing value chain

- Lack of coordination both vertical and horizontal
- Poor technology and lack of skill from production to distribution
- Lack of market-technology linkage
- Infrastructure
- Input –technology
- Problems of competing farmers with investors
- Lack of ownership of regulation
- Adulteration during processing
- Disseminating information with the product
- Identifying stakeholders which popularize
- Registered or licensed suppliers and regulation mechanism

Quality assurance:

- Check points with medicinal and nutritional values
- Packaging, dose, shelf half-life, beneficiaries, and inspection

Biodiversity

- Identify owner/community on the genetic resource
- Industrial level production
- Mutual agreements
- Legal frame work for the utilization of the indigenous knowledge
- *Moringa* supply chain should establish within the country and the export?

The Way Forward and Recommendation Points

During the workshop session major emphasis was given for strengthen the ongoing studies on *M. stenopetala*, collaboration of biomedical and agricultural researchers for further strengthening the conservation, propagation, cultivation and sustainable use through development of affordable and validated *M. stenopetala* products for subsequent community based utilization. The major points of emphasis from the workshop recommendations to guide the next steps are concisely summarized as follows:

I. Strengthen Integrated Research on Moringa stenopetala:

These facilitate the utilization of the plant besides sustaining the on-going research effort and initiating new ones to fill the knowledge gaps.

- a) The need for multidisciplinary, coordinated and focused research to validate the traditional claim on *M. stenopetala*.
- b) Setting research agenda considered to be a gap:
 - Comparative epidemiological studies on the prevalence of diabetes, hypertension, night blindness and others in selected area of South western Ethiopia where *M. stenopetala* is commonly consumed Vs in area where there it is not consumed,
 - Identification of the marker or lead compound, standardization and quality control of *M. stenopetala* raw material, processed and semi processed products in order to safe guard the public from adulterated products,
 - Systemic review and meta-analysis of the various published studies undertaken on *M. stenopetala*, studies on economical value and environmental impact of *M. stenopetala* plant,
 - Studies on the possible goiterogenic effects of *M. stenopetala* ,
 - Formulation studies on biologically active extracts of *M. stenopetala*,
 - Mechanisms of action for the studied of effects of *M. stenopetala*.

II. Information Generation and Dissemination

The workshop participants appreciated the efforts made by many researchers and the achievements so far made on *M. stenopetala* which help generate relevant information for the next steps:

- a. Participants appreciated the efforts made by EPHI to organize such an important forum which provided relevant information on medicinal, nutritional, agricultural, conservational and other value of *M. stenopetala*. This has started paving the way for strengthening collaboration, creating partnership and networking among stakeholders.
- b. Information on indigenous knowledge and scientific data so far generated on *M. stenopetala* should be compiled and systematically analyzed.
- c. Dissemination of standardized information on *M. stenopetala* to the public could include those to be promoted or prohibited considering the risk Vs benefit ratio.
- d. Preparing a guideline on *M. stenopetala* promotion and monitoring exaggerated promotions that do not have any scientific ground or justification.
- e. Consideration *M. stenopetala* edible parts to be good alternative source of food and functional foods which will give opportunity to alleviate the food insecurity and mitigate malnutrition following research and development.
- f. A regulatory mechanism should be in place for controlling the undue promotion, quality, certification and standardization of the plant/parts and suppliers.

III. Creating a Linkage and Networking

- a) The need to create linkage with food processing industry and pharmaceuticals manufacturers for value chain development through research collaboration and capacitate all the stake holders to adhere to good agricultural practice (GAP) and good manufacturing practice (GMP).
- b) *M. stenopetalals* a perennial tree and candidate plant for environmental management particularly in arid and pastoralist area. It is also useful to mitigate the issue of climate change- carbon sequestration, carbon trade.

- c) Fair and equitable sharing of the economical advantage to the indigenous community from commercialization of *M. stenopetala* products since genetic resource is always associated with Indigenous Knowledge. The community is the origin for the knowledge and natural resource has to get recognition from the merit. This could encourage conservation for sustainable utilization besides controlling massive harvest of the plant.

IV. Establishing *Moringa stenopetala* Research Task Force

Participants emphasized the need for establishing *M. stenopetala* task force to coordinate the overall activities conducted by different stakeholders on *M. stenopetala*

- Proposed Institutions for membership of *M. stenopetala* task force:
 - Ethiopian Public Health Institute (EPHI) Chair; Horn of Africa Regional Environment Centre and Network, Addis Ababa University, (HoA-REC&N) Secretary; Ethiopian Food, Medicine & Health Administration and Control Authority (EFMHACA); Ethiopian Biodiversity Institute (EBI); Ethiopian Institute of Agricultural Research.
- In addition to institutions, prominent individuals will also be members of *M. stenopetalat* ask force (coordinating on basis of their merit and contribution.
- Term of reference and plan of action could be prepared for all members of the task force which maximizes the potential use of *Moringa* by the community.

Closing remarks

Dear Honorable and Invited guests, ladies and gentlemen

It is indeed a great honor and pleasure for me to be present in this consultative workshop on reviewing the research efforts of *Moringa stenopetala* commonly known as “Sheferaw or Aleko” and setting future directions for maximizing its potential beneficial effects through collaborative efforts of all stakeholders.

Dear Colleagues and Participants,

As you all know *Moringa stenopetal* commonly known as Shiferaw is a very popular plant having multipurpose property that is used as vegetable food in some localities in Southern part of our country besides its wider usage as medicinal value by larger community members.

Coming to last two days deliberations, participants critically reviewed the research evidences of the plant commonly referred as Sheferaw that were so far done to provide standardized information for sensitization of the public on its safe use.

The knowledge gaps that need to be addressed through multidisciplinary collaborative research efforts among partners were also identified to maximize the potential benefits of the plant.

Furthermore, a clear direction was set through recommendation points in sensitizing and awareness creation of health and other professionals as well as the public at large through standardized and validated information to avoid health hazard. In addition to this controlling adulteration, maintain quality and adding values through validated processing techniques to maximize the potential advantages and the economical benefits of the plant. Participants and partner institutions are expected to work together for the implementation of the workshop outcomes for the benefit of the public. EPHI will **strengthen its linkage and collaboration among all stakeholders to put in place the recommendation points of the consultative forum.**

I appreciate the efforts and the contributions of the researchers and congratulate all for the successful conduct of the review meeting.

I thank you all.

Moringa Stenopetala



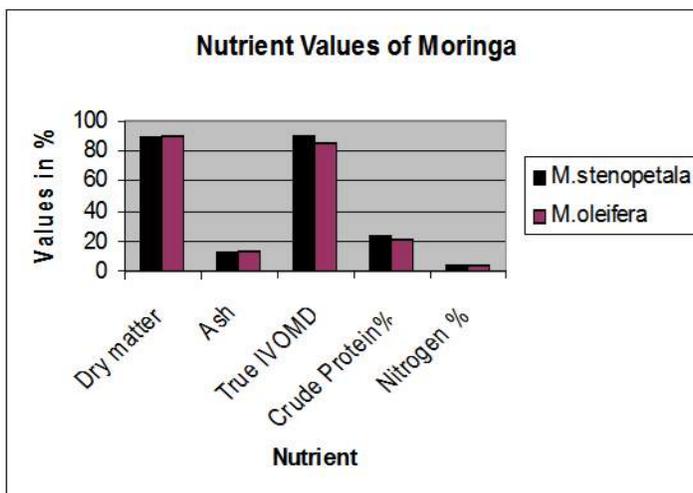
Moringa Olifera



**M. Stenopetala
seed kernels**



**M. Oleifera seed
kernel**





Consultative workshop participants visiting *Moringa* cultivation site in Modjo

List of Participants

1	Dr. Yibeletal Assefa	DDG, EPHI
2	Dr. Eshetu Lemma	SERO, EPHI
3	Dr. Yibeletal Assefa	DDG, EPHI
4	W/o Aregash Samuel	FSNRD, Director, EPHI
5	Ato Aweke Kebede	FSNRD , EPHI
6	Ato Meseret Woldyohannes	FSNRD , EPHI
7	Ato Temsgen Aweke	FSNRD, EPHI
8	Ato Redewan Muzein	FSNRD, EPHI
9	Ato Kelbessa Urga	VPD, EPHI
10	Dr. Getachew Addis	TMMRD, EPHI
11	Ato Ashenif Tadele	TMMRD, EPHI
12	W/t Hirut Lemma	TMMRD, EPHI
13	Ato Bekesho Geleta	TMMRD, EPHI
14	Ato Yehuwalashet Belete	TMMRD, EPHI
15	W/t Christina Haile	TMMRD, EPHI
16	Ato Yared Debebe	TMMRD, EPHI
17	Dr. Asfaw Debella	TMMRD, EPHI
18	W/o Abebawork Mengstu	TMMRD, EPHI
19	Ato Azaria Jambo	ANCEDA
20	Prof. Eyassu Mekonnen	Department of Pharmacology, School of Medicine, AAU
21	Prof. Yalemtehay Mekonnen	Institute of Biological Sciences, AAU
22	Ato Adugna Tadesse	People in Need
23	Ato Aschalew Nardos	College of Health Sciencesy, Hawassa University
24	Ato Tessema Seleshi	School of Pharmacy, Ambo University,
25	Ato Meberatu Eyassu	St. PaulosMellinium Medical College,
26	Ato Dechasa Jiru	Ethiopian Environment Development Organization
27	Ato Alemayehu Toma	Hawassa University
28	Ato Abdu Hassen	Dilla university
29	W/o Seble Shambel	EFMHACA
30	Dr. Zeleke W/ Tensi	EBI,
31	Ato Tamene Yohannes	EBI,
32	AtoAbenet Tekle	MI,
33	Honerable Ato Yosef Daemo	HPR/Parlama

List of participants continued

34	Ato Alemayehu Zekewos	Hawassa University
35	Ato Bekele Getachew	EFMHACA
36	Ato Beemnet Mengesha	WGARC
37	W/t Gelila Asmamaw	EIAR,
38	Ato Motuma Dadita	EBI
39	Dr. Yared Asmare	St. Paulos Millennium College,
40	Ato Mekoya Mengistu	College of Health Science, AAU
41	Dr. Dawit Solomon	St. Paulos Millennium Medical College
42	Dr. Mengistu Wube	Bio food Plc
43	Ato Yihunie Ayele:	Center for Food science & Nutrition, Addis Ababa University
44	Ato Bikila Feye	FMHACA,
45	Ato Beinam Baron	SAURBET
46	Dr. Araya Asfaw	Horn Africa
47	Ato Wondesen Girmay	Horn of Africa Regional Environment Center/Network, AAU,
48	Ato Girma Dula	Executive director, SEDA (Sustainable Environment and Development Action)
49	Ato Dekebo Dalle	Executive director, ANCEDA (Arsinegele Nature Conservation and Environment Development Association)
50	Ato Kife Wondemu	EFMHACA
51	Ato Tesfaye Regassa	People in need , Hawasa
52	Ato Biniam Berihun	Showa Robit City Administration Office, Showa Robit. Agriculture
53	Ato Habtamu Lulayeshu	Hammer Woreda health office
54	Ato Muga Urgo	Community leader or Elder from Hammer woreda.
55	Ato Shanko Muga	Hammer woreda.
56	Ato Dikara	Hammer woreda
57	Ato Lemma Wondemu	Konso woragric cooper
58	Ato Kora Garra	Community leader Konso woreda
59	Ato Chamayasha Lamita	YeonkotieHalikorAtkeltenaFerafre copper, Konso
60	Ato Camig Sahamet	Community leader Konso woreda
61	Ato Muluken Philippan	EIAR
62	W/t Heran Gerba	EFMHACA
63	W/o Teshite Guye	SEDA
64	W/o Hiwot Mohammed	Moringa private processor
65	W/o Tsehay Guyana	Moringa private processor

Moringa stenopetala Task Force (MTF) Term of Reference (ToR) and Plan of Action (PoA)

1. Background

- *Moringa stenopetala* locally known as "Shiferaw" in Amharic, "Aleko" in Wollaytegna and Gamugna and "Shelaqta" (Konso) is a plant with multipurpose property. The leaves are nutritious due to the presence of important micronutrients. It also possess promising bioactivity with potential benefits for many purposes viz. nutritional, medicinal, agro-forestry, environmental and ecological as well as industrial following value add chain. It is also a good source of generating income to the rural poor. Precautions however should be taken from its non standardized promotion as it may lead to massive uncontrolled utilization leading to undesired consequences. In view of these facts, a consultative workshop was organized by EPHI to review the indigenous knowledge and research efforts as well as identify the knowledge gap on *M. stenopetala* and disseminate evidence based information to the public besides setting future directions for maximizing its potential beneficial effects. Towards the end of the workshop, participants emphasized the need for establishing *M. stenopetala* task force to facilitate coordination, strengthening collaboration, networking and linkage among different stakeholders working in the various aspects of *M. stenopetala*. Hence, this term of reference and plan of action are prepared to facilitate the materialization of the duties of the task force
- **Institutions nominated for task force membership:-** Ethiopian Public Health Institute (EPHI) (2 delegates), Chair; Horn of Africa Regional Environment Centre and Network Addis Ababa University (1 delegate), (HoA-REC&N), Secretary; Ethiopian Food, Medicine & Health Administration and Control Authority (EFMHACA) (1 delegate); Ethiopian Biodiversity Institute (EBI) (1 delegate); Ethiopian Institute of Agricultural Research/Ministry of Environment and Forestry (1 delegate); Department of Pharmacology, School of Medicine, College of Health Sciences, Addis Ababa University (1 delegate), Faculty of Life Science, College of Natural and computational Sciences, Addis Ababa University (1 delegate); Ethiopian Environment Development Organization (1 delegate), Knowledgeable community elder from Indigenous people where *Moringa* indigenous knowledge could be accessed (1 delegate).

- **Assigned task force Members :-**

1. Dr. Asfaw Debella, Ethiopian Public Health Institute (EPHI) (Chairperson).
2. Ato Masresha Tesema, Ethiopian Public Health Institute (EPHI) (V/chairperson).
3. Ato Dechasa Jiru, Ethiopian Environment Development Organization, member.
4. Professor Yelemtsehay Mekonnen, Faculty of Life Science, College of Natural and computational Sciences, Addis Ababa University, member,
5. Professor Eyassu Mekonnen, Department of Pharmacology, School of Medicine, College of Health Sciences, Addis Ababa University, member.
6. Dr. Zeleke W/ Tensi, Ethiopian Biodiversity Institute (EBI), member
7. Dr. Shimelis Tadesse Ethiopian Institute of Agricultural Research, member
8. Ato Kora Gara, Community elder from Konso, member.
9. Delegate from Ethiopian Food, Medicine & Health Administration and Control Authority (EFMHACA), member .
10. Ato Wondesen Girmay, Horn of Africa Regional Environment Centre and Network Addis Ababa University (HoA-REC&N), Secretary.

2. Scope of the Task Force

- Facilitates the various activities pertaining *M. stenopetala* to maximize its benefits in sustained manner through value add chain in health and nutrition, industry, agro-forestry, biodiversity and environment.

3. Purpose (Outcome)

- Compilation of evidenced based information on *M. stenopetala* to facilitate the development of standardized product through value add chain for the benefit of the public.

3. Objectives

General

- Facilitates the overall activities pertaining to *M. stenopetala* to generate scientific evidences on its medicinal, nutritional, industrial and other uses through research and development, and value add chain for improved livelihoods as well as to disseminate standardized information to the public.

Specific

- Compiles all research undertaking on *M. stenopetala* and identify research gaps to generate additional scientific evidences in different discipline,
- Facilitate value add chain of *M. stenopetala* through good agricultural practice (GAP) and good manufacturing practice (GMP) for food and feed security as well as other economic benefits,
- Supports the dissemination of standardized information to the public based on scientific evidence,
- Support the facilitation of integrated research in different discipline,
- Facilitates the promotion of good quality *M. stenopetala* products generated through value add chain through ensuring the necessary safety precautions for medicinal, nutritional and other purposes,
- Strengthen collaborative efforts to maximize the benefits of *M. stenopetala* In health, agro-forestry, environmental rehabilitations, industry and other areas through ensuring the conservation of biodiversity for sustainable use and equitable benefit sharing of the indigenous community.

3. Term of reference (ToR) of the task force

- **3.1 Task force responsibilities / term of reference (ToR)/**
 - The committee finalize the draft ToR through the necessary amendment and corrections,
 - The task force is accountable to the Deputy Director General of EPHI,
 - The nominated institutions/organization shall assign an appropriate expert to participate in various activities of the task force,
 - The chairperson of the task force is from EPHI and nominated by the Deputy Director General of EPHI,
 - The secretary of the committee is from Horn of Africa Regional Environment Centre and Network Addis Ababa University, (HoA-REC&N)
 - Prepare short, medium and long term plans as well as working modalities, monitor and coordinate various activities to maximize the potential benefits of *M. stenopetala*,
 - Organize different forums and meetings to discuss on research. development & technological findings, problem solving approach for challenges, any other updates and information's with various partners,
 - Organize ad-hoc groups in different sectors/discipline, supports and make follow up to facilitate the execution of planned activities,
 - Provide technical assistance and prepare a protocol or standard operational procedure for close follow up and guidance of the ad-hoc groups,

- Decisions will be made by consensus as much as possible. If consensus cannot be reached, members will vote and the majority vote (50+1) will win
 - The meeting period of the task force members will be every month unless there is a need for an urgent meeting. Discussed points during the meeting will be recorded in minutes and approved by the signature of the committee members,
 - The tenure period of the task force is for the period of plan of action *i.e.*, 2 years
 - The ToR is amendable for revision.
- **3.2 Chairperson of the task force**
 - Chair the meeting of the task force based on the agenda communicated earlier to committee members,
 - Call and facilitates the meeting place of the committee, the fair flow of ideas during the meeting,
 - Facilitates the execution of the resolutions of the committee members through DDG-EPHI and collaborating partners,
 - Generate ideas, prepare draft plan and miscellaneous documents that are important for the smooth executions of the objectives of the task force and share to committee members for discussion to reach to consensus for the implementations,
 - Update committee members miscellaneous latest information pertaining any development or progress that will facilitate the objectives of the task force,
 - Make all the efforts in the of the achievement of the set objectives, execution of the plan of action and term of reference of the task force.
- **3.3 Secretary of the task force**
 - Notify earlier the agenda, date and time of the committee meeting to committee members through e-mail,
 - Remind all committee members earlier if a pre-scheduled meeting is cancelled or there is a need for an urgent meeting,
 - Record the discussed points based on the agenda during the meeting and share through e-mail,
 - Distribute the minute of the meeting and all other necessary documents to the task force members before the next meeting and get the endorsement of the minute through signature during committee meeting,
 - Share the endorsed minute of the committee to the committee members and task force members institutions,
 - Remind the assignment given to committee members to facilitate the executions of their assigned work,

- Make all the efforts in the execution of the objectives, plan of action and term of reference of the task force

- **3.4 Members of the task force**

- Participate actively in any affairs of the task force,
- Be punctual in the taskforce meeting and participate actively during the meeting,
- Notify earlier to the secretary any agenda to be considered during the meeting of the task force committee,
- Execute any assigned duties or activities given by the task force ,
- Make all the efforts in the execution of the objectives, plan of action and term of reference of the task force

4. Plan of Action (PoA) (June 2014 to March 2016)

No	Plan category	Activities planned	Detailed activities	Responsible individual, institution / organization	Resources/ Budget estimates (Birr)	Time frame
1	Immediate plan 4 months June to September, 2014	1. Identify the role, objective and ToR of the task force ,	- Preparation of draft ToR & PoA, Sharing to task force members through e-mail and enriching in a meeting,	EPHI delegates of task force	None	Mid of June, 2014
		2. Edit the proceedings of <i>M. stenopetala</i> workshop,	- Compilation of the feedback and Sharing the amended version for endorsement,	Task force members		Cost estimate for printing Birr 50,000 (EPHI)
		3. Facilitate printing and dissemination to all stake holders.	- Sharing the compiled proceeding for feedback, accommodation of comments,	Task force members	EPHI delegates	
		4 Organize a forum with media to give a standardized information on <i>M. stenopetalato</i> to the public,	- Preparation of draft document for press release/ panel press conference - Sharing to task force members for enriching	Chairperson Task force members	None/ if the need arises facilitates through EPHI	Up to July. 1 st week, 2014

No	Plan category	Activities planned	Detailed activities	Responsible individual, institution / organization	Resources/ Budget estimates (Birr)	Time frame
	Immediate plan 4 months June to September, 2014	5. Sensitize and create public awareness through various media,	- Assign task force members participating in the press conference and arranging a program with journalists	Assigned task force members PR of EPHI		July. 2 nd to 3 rd week of July 2014
		6. Identify stakeholders dealing with <i>M. stenopetala</i> and organize Ad-hoc group in each discipline or sector to establish a mechanism for closely monitor and sustain follow up,	- List out potential stakeholders that dealt in R&D, cultivation and conservation, value add chain etc of <i>M. stenopetala</i> through e-mail communications and organize Ad-hoc group following discussion	Task force members	None	4 th week July 2014 to September 2014
		7 Establish communication line with Ad-hoc group in each discipline or sector,	- Develop formats for Ad-hoc group to facilitate information exchange and updates		Cost incurred will be covered by EPHI and other possible task force institutional contributors	
		8. Develop format to facilitate information update with Ad-hoc group in various sectors,	- Establish communication line with Ad-hoc group possible coordinators. If there is a possibility organize a meeting with working group coordinators	Task force members		4 th week July 2014 to September 2014
		9. Submit reports periodically to EPHI-DDG and collaborating partners for actions and directions	- Prepare and submit report at the end of the immediate plan to EPHI-DDG and collaborating partners			

No	Plan category	Activities planned	Detailed activities	Responsible individual, institution / organization	Resources/ Budget estimates (Birr)	Time frame
2	Intermediate plan 8 months September 2014 to April 2015	<p>1. Compile all information available (publications, technical reports, etc) on <i>M. stenopetala</i> through systemic review and meta analysis,</p> <p>2 Identify knowledge gap on sustainable use, access and beneficiaries, and safety issue of <i>M. stenopetala</i> (adulteration with cheap materials, quality in processing, etc) as well as legal bases.</p> <p>3. Create a net work and link with universities and research institutions to be updated on the status and progresses of any ongoing researches on <i>M. stenopetala</i> and to make the periodic follow up,</p>	<ul style="list-style-type: none"> - Make systemic literature review on the research works of <i>M. stenopetala</i> and meta analysis, - Create a data base on research and other works of <i>M. stenopetala</i> - Enumerate the list of gaps in evidence based information that need to be addressed through research and development. - Create a link with universities, research institutions and those involved in agro-forestry, value add chain and production of <i>M. stenopetala</i> through e-mail and other means. 	Task force members in their respective discipline	Cost incurred to be covered by EPHI and possible task force institutional contributors	September 2014 to December 2014
		4. Set multidisciplinary research agenda on <i>M. stenopetala</i> on priority basis in various discipline and facilitates the implementation through proposal development and periodic monitoring and	<ul style="list-style-type: none"> - Identify the gaps in evidence based information of <i>M. stenopetala</i> and set research agenda directions on priority basis. 	Task force members in their respective discipline	Cost incurred could be facilitated through institutional contributors	January 2015 to April 2015

No	Plan category	Activities planned	Detailed activities	Responsible individual, institution / organization	Resources/ Budget estimates (Birr)	Time frame
	<p>Intermediate plan</p> <p>8 months</p> <p>September 2014 to April 2015</p>	<p>evaluation of the execution,</p> <p>5. Assess the existing resources among partners and identify various activities to be undertaken by the task force and Ad-hoc groups,</p> <p>6. Facilitate <i>M. stenopetala</i> fund for research and development to maximize its potential benefits for the public,</p> <p>7, Organize periodic forums and meeting to discuss with working group in various sector on the progress status in the research, promotion, utilization and other aspects,</p> <p>8. Submit reports periodically to EPHI-DDG and collaborating partners for actions and directions</p>	<ul style="list-style-type: none"> - Notify/aware or communicate researchers/academia to prepare a proposal on the set research agenda. - Request task force institutions to facilitate the fund through soliciting potential donors for the research undertakings on <i>M. stenopetala</i> to maximize its potential benefits - Organize a forum for all stakeholders to discuss the various undertakings and challenges - Prepare and submit report every 3 months to EPHI-DDG and collaborating partners 	<p>Task force members</p>	<p>Cost incurred could be facilitated through task force institutions</p>	<p>January 2015 to April 2015</p>

No	Plan category	Activities planned	Detailed activities	Responsible institution / organization	Resources/ Budget estimates (Birr)	Time frame
3	<p>Long term plan</p> <p>11/2 years</p> <p>April 2015 to October 2016</p>	<p>1. Coordinate and make follow up the studies and any other investigations in integrated way,</p> <p>2. Strengthen collaborative research efforts and partnership, networking and coordination among biomedical, medical, agricultural, industrial and other sector researchers engaged on <i>M. stenopetala</i> research,</p> <p>3. Make closely follow up on the fair and equitable sharing of the economical advantage to the indigenous community from commercialization of <i>M. stenopetala</i> products,</p> <p>4. Make closely follow up on the fair and equitable sharing of the economical advantage to the indigenous community from commercialization of <i>M. stenopetala</i> products,</p> <p>5. Organize periodic forums and meeting to discuss with working group in various sector on the progress status in the research, promotion, utilization and other aspects,</p> <p>6. Strengthen collaborative efforts for commercialization of standardized <i>M. stenopetala</i> products,</p> <p>7. Submit periodic and final reports to EPHI-DDG and collaborating partners for actions and directions.</p>	<ul style="list-style-type: none"> - Periodic contact with Ad-hoc group for a feed back and updates - Organize a view exchange forum for Ad-hoc group for collaboration - Getting a feedback through communications on the progress of ongoing research work, access benefit sharing, value added chains, etc - Organize a technical or scientific, etc forums for all stakeholders to discuss the various undertakings completed research works, value add chain for commercialization, etc and the challenges - Prepare and submit report every 3 months including final report to EPHI-DDG and collaborating partners. 	<p>Task force members</p>	<p>Cost incurred could be facilitated through task force institutions</p>	<p>April 2015 to October 2016</p>



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