Second RUFORUM Biennial Meeting 20 - 24 September 2010, Entebbe, Uganda

Research Application Summary

Analysis of multipurpose uses and management of *Zizphus spina-christi* (L.) desf. in semi-arid Ethiopia: Implications for food security

Debela Hunde Feyssa[1], Njoka, J.T.[2], Zemede Asfaw[3] & Nyangito, M.M.[2]
[1]University of Nairobi, College of Agriculture & Veterinary Sciences, Department of Land Resources & Agricultural Technology, Home Institute, Jimma University, Ethiopia
[2]University of Nairobi, College of Agriculture & Veterinary Sciences, Department of Land Resources & Agricultural Technology, Kenya
[3]Addis Ababa University, College of Natural Sciences, Department of Biology, Ethiopia
Corresponding author: feyssahunde@yahoo.com; feyssahunde@gmail.com

Abstract

Quantitative ethnobotanical study of *Ziziphus spina-christi* was undertaken in six areas of east Shewa, Ethiopia. Both structured questionnaire and focus-group interviews were conducted with about 200 households. Arable land cultivation, and increased frequencies of drought are reducing areas under *Z. spina-christi*. The multi-purpose tree is highly nutritious, helps main soil fertility, and is an important source of income in the region. Research and policy support are needed to exploit the potential of this agroforestry tree species.

Key words: East Shewa, food security, nutrition, wild fruits, *Ziziphus spina-christi*

Résumé

L'étude ethnobotanique quantitative de *Ziziphus spina-christi* a été entreprise dans six régions de Shewa de l'Est, en Ethiopie. Des questionnaires structurés et les interviews dans le groupe de discussion ont été conduits avec environ 200 ménages. La culture de terres arables, et les fréquences accrues de sécheresse réduisent les régions sous *Z. spina-christi*. L'arbre universel est fortement nutritif, aide la fertilité principale du sol et est une source importante de revenu dans la région. L'appui à la recherche et à la politique sont nécessaires pour exploiter le potentiel de cet arbre d'agroforesterie.

Mots clés: Shewa de l'Est, sécurité alimentaire, nutrition, fruits sauvages, *Ziziphus spina-christi*

Background

Wild foods provide diversity of nutrients in the diet of many households, especially in semi-arid and humid tropics. They are especially important at times of food shortage and an important coping strategy (Asfaw and Taddesse, 2001; Harris and Mohammed, 2003).Increased consumption of wild-foods enables people to cope better with erratic, untimely rains and

drought without facing severe food shortages, famine and general asset depletion (Mathys, 2000; Saied *et al*., 2008). Preferred wild edible plants are however becoming rare due to agricultural expansion caused by population pressure and this has been exacerbated by the increasing incidence of climate change and variability.

There are diverse wild plants in semi arid east Shewa, Ethiopia. Among widely used multipurpose wild plants is *Ziziphus spina-christi* in the family Rhamnaceae. Fruits of *Z. spina-chrsti* are important as a supplement to daily diet, and at times of food scarcity in drylands. However, in spite of the potential of wild edible plants to household food security little attention has been given to their formal production (Guindad and Lemessa, 2000). Lack of focused research on multipurpose use and management has hindered successful improvement and promotion of wild plants in formal production system. Therefore, this study has focused on analysis of the multipurpose uses of *Z. spina-christi's* management, fruit yield and nutrient composition in the semiarid part of east Shewa, Ethiopia.

Literature Summary

Wild foods provide diversity, vitamins and minerals in the diet of many households (Harris and Mohammed, 2003). *Z.spina-christi* is one of the widely used wild edible plants in Ethiopia. It is especially important at times of food shortage (Guinand and Lemessa, 2001). Knowledge of wild foods varies according to localities and lifestyles of people (Balemie and Kebebew, 2006). Land-use change due to agricultural expansion is reducing the areas where wild foods were previously abundant. The distribution area of several wild species is shrinking with the land use changes. Yet these species are important as a supplement to daily diet, and at times of food scarcity. They also provide an opportunity to generate income when they are traded (Eden Foundation, Sweden, 1992; Fentahun and Hager, 2009). In Ethiopia, the use of *Z.spina-christi* is an important coping strategy for rural communities. However, it is not abundant where resource degradation is compounded with the population pressure and climate change. Therefore, there is a need to complement formal and local management practices.

Study Description

Quantitative ethnobotanical study of *Z.spina-christi* was conducted from October 2009 to June 2010 in Boosat and Fantalle districts covering 6 semi arid sites of east Shewa, Ethiopia. Data on multipurpose use and managements by local people were gathered using a semi-structured interview of 120

randomly chosen household heads and key-informant interviews. Focus group discussions were also held with key informants. Direct field explorations by the researchers were also undertaken to generate data on uses, management and preferences for *Z.spina-christi* following procedures outlined by Martin (1995), Cotton (1996) and Balamie and Kebebew (2006). Annual average fruit yield was determined by closing trees. Nutritional analysis was done by standard laboratory methods (AOAC, 1990). Data generated were qualitatively and quantitatively analyzed and summarized in percentiles, average values and ranked.

Research Application

Field inspection showed that *Z.spina-christi* was abundant in enclosed pasture and traditional agroforestry systems in semi arid east Shewa. Field exploration, focus group discussions and key informants interviews revealed that *Z. spina-christi* was considered a drought tolerant fruit tree. Multiple uses of Z. *spina-christi* identified included the use of dried or fresh fruits as human food, leaves for fodder, branches for fencing, wood for farm implement, making household utensils, construction and furniture making. The use of fruits, leaves, roots and bark in traditional medicine was mentioned by 80.8% of informants. The tree bark is used to treat hepatitis 'dhibe sinbira' by local people.

Z.spina-christi provides fuel wood, bee fodder and shade. Informants also confirmed its role in soil improvement and soil conservation, acting as mulch thus enhancing water infiltration to soil. The fruit was recognized by informants as an additional diet and most preferred of 30 wild edible plants identified in the study area.

Z.spina-christi was reported to have high regeneration capacity. Farmers and pastoralists managed it by pruning the tree to get more branches and leaves for forage and fruits for food and income generation. Leaves and fruits were mostly eaten by cattle, sheep, goat, and camel. Fruits are eaten by birds and contribute to poultry production, the by-products fertilize the soil thereby contributing to nutrient cycle.

Average yield of managed tree was 200 kg per year. A survey of four local markets established the price of 200gm fruits at 0.50 Ethiopian Birr (ETB). Annual average income a household can generate from fruits of a tree is about 500 ETB.

Analysis of fruits pulp found 8.1-16.4% of minerals. Proteins and carbohydrates constituted 45-4-20 % and 76.7-86.1%, respectively and average energy was 122.38 kcal which is higher than that of *Sorghum bicolor* porridge (104 kcal). The species was adapted to drylands.

Recommendation

The results show that *Z.spina-christi* is an important tree crop in the semi-arid areas of Ethiopia. It has high mineral content and also provide nutrients to the soil (data not presented). The importance of this tree species is likely to increase, especially in light of climate change being experienced in Ethiopia and neighbouring countries.

Appropriate policies and strategies for conservation measures, mass cultivation and integration of *Z.spina-christi* into dryland agroforestry/agrobiodiversity for diversification of food sources and maintenance of biodiversity are needed. Local use and management of *Z.spina-christi* need to be supported by scientific research.

Acknowledgement

We thank RUFORUM for funding the study, and the Association of African Universities for covering part of the research work. We also thank local people and district management of east Shewa, Ethiopia for sharing valuable information and facilitating the field work.

References

AOAC. 1990. Official methods of analysis, 14th Edition, Association of Official Analytical Chemists, Washington DC.

Asfaw, Z. and Taddesse, M. 2001. Prospects for sustainable use and development of wild food plants in Ethiopia. *Economic Botany* 55(1):47-62.

Balemie, K. and Kebebew, F. 2006. Ethnobotanical study of wild edible plants in Derashe and Kucha Districts, South Ethiopia. *Journal of Ethnobotany and Ethnomedicine* 2(53):1-9.

Cotton, C.M. 1996. Ethnobotany principles and applications. Chichester, New York John Wiley and Sons Ltd.

Eden Foundation, Sweden 1992. Nutritional study on *Ziziphus spina-christi*. Tanout, Niger, 2, p.1.

Fentahun, M.T. and Hager, H. 2009. Exploiting locally available resources for food and nutritional security enhancement: wild fruits diversity, potential and state of exploitation in the Amhara region of Ethiopia. *Journal Food* 1(2):207-219.

Guinand, Y. and Lemessa, D. 2001. Wild-food plants in Ethiopia: Reflections on the role of 'wild-foods' and 'famine-foods'

at a time of drought. UNDP, Emergency Unit for Ethiopia (UNDP-EUE).

Harris, F.M.A. and Mohammed, S. 2003. Relying on nature: Wild foods in northern Nigeria. *Ambio* 32(1):24-29.

Martin, G.J. 1995. Ethnobotany: A methods manual. London, UK: Chapman and Hall.

Mathys, E. 2000. Assessment of the impact of food aid on household economics of North Wollo, South Wollo and East Hararge, Ethiopia. Food Security Unit, Save the Children (UK), Nairobi, Kenya.

Saied, A., Gebauer, J., Hammer, K. and Buerkert, A. 2008. *Ziziphus spina-christi* (L.) Willd: a multipurpose fruit tree. *Genetic Resources and Crop Evolution* 55(7):929-937.