Research Application Summary

Ethnopharmacology, phytochemical and toxicity of medicinal plants used against livestock helminthes in drylands of Uganda

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Abstract

An ethno-pharmacological practices of pastoral communities is being studied in Nakasongola, Uganda. It is documenting indigenous knowledge about helminthoses diagnosis and management. Thirty seven (37) medicinal plants have been identified, and women were found to be more knowledgeable about livestock diseases than men, including in aspects of ethno-pharmacological practices.

Key words: Ethno-pharmacological practices, indigenous knowledge, pastoral communities, Uganda

Résumé

Des pratiques ethno-pharmacologiques des communautés pastorales sont étudiées à Nakasongola, en Ouganda. Il est question de fournir des informations sur la connaissance indigène au sujet du diagnostic et de la gestion des helminthoses. Trente sept (37) plantes médicinales ont été identifiées, et des femmes se sont avérées plus informées au sujet des maladies de bétail que des hommes, y compris les aspects des pratiques ethno-pharmacologiques.

Mots clés : Pratiques Ethno-pharmacologiques, connaissance indigène, communautés pastorales, Ouganda

Background

The economic importance of helminthoses and its association with livestock production losses in sub-Saharan Africa cannot be underestimated. Helminthes are more widespread in tropical regions due to climatic, management and sociological factors. Despite this importance, helminthes are the most neglected area of veterinary care particularly where extensive grazing is practiced. In sub Saharan Africa, and Uganda in particular, modern methods of helminthes treatment have been by use of three classes of synthetic drugs of which helminthes have become resistant (Behnke *et al*., 2008).

Medicinal plants are one of the important natural resources in drylands on which rural communities depend upon based on various levels of indigenous knowledge. There are a range of the health problems caused by micro and macro organism like helminthes in both human and livestock which are treated using medicinal plants. They have potential as alternative source of income; provide raw materials to pharmaceutical industries; contribute to biodiversity; and play a central role in climate change adaptation strategies.

Despite the existence of diverse indigenous knowledge of herbal medicine in Uganda, livestock producing communities are increasing facing the problem of low productivity and livestock deaths from helminthes, escalating into increased poverty and food insecurity. Phytotherapy in veterinary medicine still lacks general acceptance because of the efficacy, dosage, safety and active principles of most of the herbal preparations are not known. If left unchecked, medicinal plant loss will lead to reduced biodiversity, reduced livestock disease resilience, food insecurity and poverty leading to increasing human vulnerability to climate change impacts. There is therefore an urgent need to document ethnopharmacological practices of medicinal plants used in livestock helminthes control not only their use, but also determine their phytochemical constituents and effects in biological systems.

Literature Summary

According to Bruhn and Holmstrdt (1981), ethnopharmacology embraces the scientific exploration of biologically active agents traditionally used by man through field observations and descriptions of the use, effects of native remedies, botanical identification and phytochemical and pharmacological studies. Of the estimated 250,000 higher plant species on this planet, only 6% have been tested for biological activity and 15% have been evaluated phytochemically (Fabricant and Farnsworth, 2001).

Different reports have shown that some plants used in helminthes control are toxic to animals at high doses (Toma *et al*., 2009). Efficacy studies carried out in different parts of Africa, on different medicinal plant species and worm species have revealed varying efficacies (Gakuya, 2001; Githiori *et al*., 2005; Sujon *et al*., 2008) while others have revealed no activity at all. According to Makut *et al*. (2008), plants secondary metabolites like alkaloids, tannins, flavonoids, glycosides, phenolic compounds, steroids and volatile oils are responsible for the

physiological effect in the animal body. Briskin (2000) acknowledges that these compounds exert their effects through synergistic action at single or multiple target sites unlike the synthetic drugs. The synergistic interactions underlie the effectiveness of phytomedicines as well as decreasing the potential toxicity of some individual constituents (Kaufman *et al*., 1999). Studies conducted by Pribitkin (2005) showed that herbal remedies possess significant pharmacological activity and these have potentially adverse effects, which vary from relatively safe to potentially lethal.

Study Description

The study documented ethno-pharmacological practices of rural communities of drylands of Uganda at study sites located in Nakasongola district comprorising of agro-pastoralists. It involved identification of indigenous knowledge about helminthes diagnosis, anthelmintic plants, patterns of use and effects on animal health. Indigenous knowledge was obtained through Rapid Rural Appraisal techniques (Chambers, 1992). Further studies will be conducted on efficacy, toxicity and phytochemistry. Efficacy bioassay experiments will be conducted using Ascaris suum model where larval migration inhibition (Rabel *et al*., 1994) and adult worm motility inhibition (Eguale *et al.,* 2006) assays will be carried out at five levels of plant extract concentration with three replicates each. The qualitative phytochemical screening will be done using chemical analysis and thin layer chromatographic technique (Harborne, 1973). Acute oral toxicity test will be carried out in mice following OECD guidelines. A General Linear Model will be used to determine the response of worms to plants' extracts. Probit and Logit analysis will be used to estimate ED_{50} and LD_{50}.

The survey was carried out in Nakasongola district in the Ugandan cattle corridor using focus group discussions and key informant interviews. The fourteen focus groups comprised of 187 agro-pastoralists aged 30-72 years of whom 47% were women and 53% men. Of the 32 key informants interviewed, 65.6% were women and 34.4% were men.

Research Application

Thirty seven medicinal plants belonging to 28 genera and 24 families were reportedly used to treat livestock helminthosis across livestock species. About 78.4% were harvested from the wild populations with plant parts used estimated at 54.1% leaves and 29.7% roots. The survey revealed that women were more familiar with livestock diseases diagnosis and

management compared to men. The phytochemical screening of the five most used plants species revealed presence of tannins, saponins, flavonoids, alkaloids, anthracenones and anthocyanins.

Standardization of phytotherapy can provide alternative livestock therapy in rural areas especially in drylands with limited resources. Ethnopharmacological studies can lead to development of novel and safe medicines and pilot alternative source of income to dryland communities especially women who are economically and socio-politically disadvantaged. This will further contribute to the global strategy to overcome extreme hunger and poverty (MDG1) through reduced livestock deaths and environmental protection (MDG 7) and increased conservation of medicinal plants.

Recommendation

Efficacy and toxicity studies are crucial in understanding the usefulness of ethnopharmacology of tropical plants. Detailed cross analytical procedures and standardization will be needed.

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