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Plants used in traditional healthcare of livestock: A case study from Kendrapara district, Odisha, India

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Abstract

Ethnoveterinary practices concern to animal healthcare is as old as the domestication of various livestock species. They comprise belief, knowledge, practices and skills pertaining to healthcare and management of livestock. The Indian subcontinent has rich ethnoveterinary health traditions that are the products of decades of experiences. The objective of the present study is to document the prevalent folk medicinal knowledge of plants used for the treatment of various ailments of livestock in Kendrapara district of Odisha, India. The study was carried out during Dec 2014 to May 2016 by taking interviews and discussions with the local inhabitants of the district. A total of 44 plant species representing to 43 genera and belonging to 33 families have been enumerated for ethnoveterinary practices as remedy for 23 types of animal ailments. Among the families Fabaceae ranks top followed by Apocynaceae. Most cited diseases are diarrhoea, dysentery wound, bone fracture, eczema, fever, mastitis, stomach trouble etc. Most frequently used plants are *Acanthus ilicifolius* L., *Bambusa arundinacea* (Retz.) Willd., *Cajanus cajan* (L.) Mill., *Cissus quadrangularis* L., *Madhuca indica* Gmel., *Mentha spicata* L., *Pongamia pinnata* (L.) Pierre., *Saraca asoca* (Roxb.) de Wilde., *Sesamum indicum* L., *Syzygium cumuni* L. Skeels., *Terminalia bellirica* (Gaertn.) Roxb. and *Trachyspermum ammi* (L.) Sprague. Low cost and almost no side effects of these medicines make them acceptable by the local community. The information is expected to be of use for ethnoveterinary practices and herbal drug industry.

Keywords: Ethnoveterinary practices, medicinal plants, Odisha, traditional knowledge

1. Introduction

Nature has blessed us with remedies to sustain or restore our health. Phytotherapy, with its roots in the past, it is still relevant within every culture and meaningful in the present, offering great potential contributions to modern medicine. In any individual culture, the botanicals used are those that are available within the geographical location and addressed local health concerns. Traditional folk veterinary medicine is the integration of the local knowledgeses, related skills and custom procedures created by people for purpose of preserving health and welfare of working and productive animals^[1]. Ancient records on animal health care are found in *Vedas*, *Puranas* like *Ashwapuran*, *Garudpuranan* and *Hastipuranan* which devoted to animal husbandry^[2]. In these ancient times, knowledge already existed how to prepare a number of remedies to counter prevailing ailments in human beings and also in animals. The *Atharvaveda* hails the benefits of a protective ointment for human beings, cows and horses. Towards the end of the Vedic period, Indian medicine began to adopt observation and rational procedure, which developed into a coherent system known as *Ayurveda* (from knowledge [veda] concerning longevity [Āyur])^[3]. This knowledge served as a model for veterinary medicine, producing as specialized literature in Sanskrit and in other languages of India. Some of this literature was even translated into Tibetan, Arabic and Persian^[3, 4-6]. The surviving texts are concerned mainly with the treatment of human and domestic animals. Three chapters in Āyurvedic medicine are devoted to veterinary medicine: a treatise on elephants and their medical treatment; one on horses and diseases of horses; and the third on the care of cattle and other domestic animals^[7]. By the end of the eighteenth and beginning of the nineteenth century almost nothing was known about chemical composition of plants. By modern scientific research an active healing action is confirmed for a great number of plants used in traditional medicine. In recent past, development of 'Artemisinin' from *Artemisia annua* and 'Maprouneacin' from *Maprounea Africana* is excellent examples^[8, 9]. By the end of the last century, the four fifths of human population in the world used phytotherapy and other forms of

folk medicine with the aim of prevention and treatment of human and animal diseases ^[10, 11]. Nonetheless, the long history and powerful reputation of healing properties of many types of plants are impressive.

Livestock provides a wide range of products and services including animal power and supplementary nutrition. India is an agricultural country and roughly 80% of the population is dependent on agriculture and livestock. Substantial number of people lives in rural areas with minimum land holdings are still depends on their bullocks or buffaloes for agricultural practices. The farmer maintains one or two heads of cattle, essentially for plowing purposes, for the production of milk, which is sold to retailers for some additional income. Some households also raise a few goats and pigs primarily for selling. Domestic animals are being treated for various ailments with century-old herbal medicines in many Indian villages. The high cost of pharmaceutical products and lack of access to veterinary services are significant reasons for farmers to use non-conventional medicines. Despite the fact that ethnoveterinary medicine has been very crucial for the animal healthcare of most developing countries, it has not yet been well documented and much effort is needed in research and integration activities in these countries ^[12]. Some studies on ethnoveterinary practices from different regions of India have been reported ^[13-18] but there are no such studies are available for Odisha except a few studies in the last decade ^[19-22]. In view of this, the present study was conducted to identify, collect and document the ethnoveterinary medicinal plants used by people of Kendrapara district and their utilization for primary healthcare of animals in treatments of different ailments.

Materials and Methods

Study area

Kendrapara district (20° 21' - 20° 47' N and 86° 14' - 87° 03' E) is situated in central coastal plain zone of the Odisha (Fig.1) and covers an area of 2644 sqkm with a population of 15.582 lakhs (2011 Census). Four other districts namely Cuttack, Jagatsingpur, Jajpur and Bhadrak surround Kendrapara district while a part is bounded by the Bay of Bengal. The district lies in the river delta formed by the Brahmani and Baitarani as well as branch rivers of Mahanadi. Majority of the people are villagers (94.2%) with agriculture as their main occupation from ancient period. They also rear cattle which play a pivotal role in the agricultural system. The district accounts for 1.7% of the state's territory and shares 3.5% of the state's population. The climate of the district is warm and humid. Three distinct seasons are felt during the year. Rainy season (June to October), winter (November to February) and summer (March to June). The annual rainfall is varying from 1500 mm to 1550 mm. The air temperature ranges from 17° to 45°C. Periodic earth tremors, thunder storms in the rains and dust storms in April and May are characteristic features of the district. The district has its unique importance in the world for 'Bhitarkanika national park' and Gahirmatha sanctuary for *Olive ridley* turtles. The shrines of "Baladevjew" (Lord Balabhadra) and "PanchaBarahi" (the five mothers) along with numerous ancient shrines are further characteristic features of the place.

Data collection

In order to document the utilization of indigenous medicinal plants for ethnoveterinary purpose, the field study was carried out from December 2014 to May 2016 following established and standard procedures ^[23-25]. Before the field study- aims,

methods, anticipated benefits of the study were adequately explained to the informants in local language, i.e. (Odia), due consent and cooperation was taken for the documentation of the traditional plants used by them. The healers were the main informants, and their responses to our questions were recorded. One of us was responsible for writing down all the answers and information given by the healers. Structured questionnaires, complemented by free interviews and informal conversations were followed ^[26]. The experienced rural folk, traditional herbal medicine practitioners who were having knowledge of traditional healing were interviewed about the use of plants for different ailments. Sixty three (55 men and 08 women) persons belonging to three different age groups were interviewed. Surveys were conducted in different villages of the district. Information on vernacular names, life forms, growth, local status, growth ranges, sources, parts used, preparation, administration, and uses of the plant species were collected and recorded from the informants. Personal interviews and group discussions with local inhabitants revealed some valuable and specific information about the plants, which were further compared and authenticated by crosschecking ^[27]. The collected plant specimens were identified by using standard floras and available literatures ^[28, 29]. The identified species were photographed and the voucher specimens were deposited in the herbarium of Botany Department, Chandbali College, Chandbali. The list of medicinal plants were depicted in a tabular form along with their botanical names followed by family, their vernacular names in Odia if any and the parts used for medicinal purpose.

Results and Discussion

Traditional knowledge of plant species utilization by various indigenous communities for a variety of purposes (medicinal, construction, food, fodder etc.) is based on their necessities, instincts, observations, trial and error and evolved over generation of long experience and practices. This knowledge is passed from generation to generation and contributed to the accumulation of a complex wealth of knowledge and skills ^[30, 31], which is mysterious to the modern world. Moreover, studying local knowledge is useful in documenting, analyzing and disseminating of the knowledge on the interaction between biodiversity and human society and how it is valued in different societies and how it is influenced by human activities ^[25]. In this regard multi-locational and multi-ethnic medicinal use of a plant possesses medicinal potential against particular disease ^[32]. In the villages of Kendrapara region of Odisha rural inhabitant are still dependent on folk medicines for their livestock treatment. The current study established a total of 44 plant species representing to 43 genera and belonging to 33 families have been enumerated for ethnoveterinary practices as remedy for 23 types of animal ailments (Table 1; Fig. 2). Among these families Fabaceae occupies highest position with 4 species followed by Apocynaceae with 3 species, Amaranthaceae, Araceae, Combretaceae, Cucurbitaceae, Myrtaceae, and Verbenaceae with 2 species each, and the rest of the families had only one reported species. The most cited diseases are diarrhoea, dysentery wound, bone fracture, eczema, fever, mastitis, stomach trouble etc. (Table 1). Most frequently used plants are *Acanthus ilicifolius* L., *Bambusa arundinacea* (Retz.) Willd. *Cajanus cajan* (L.) Mill., *Cissus quadrangularis* L., *Madhuca indica* Gmel., *Mentha spicata* L., *Pongamia pinnata* (L.) Pierre., *Saraca asoca* (Roxb.) de Wilde., *Sesamum indicum* L., *Syzygium cumuni* L. Skeels., *Terminalia bellirica*

(Gaertn.)Roxb. and *Trachyspermum ammi* (L.) Sprague. The leafy parts occupies the highest position (35.8%) followed by whole plant (17%), seed (11.3%), stem and bark (9.4%) each, root and fruit (5.7%) each and others (5.7%) [Fig.3]. Although in ethnoveterinary medicine every part of the plant is used like leaves, roots, bark, stem, flowers, seeds etc.^[33,34] but leaves are more widely used than other part^[13,35]. Among the various growth forms, herbs contributed the maximum (34.1%) followed by trees (31.8%), shrubs (27.3%) and climbers (6.8%) as shown in figure 4. The preferential use of herbs is also documented earlier^[14, 36]. Most of the medicinal plant resources (65.9%) were collected wild and only a few (13.6%) were collected from cultivated areas (Fig.5). Some of the reported plant species has been amply demonstrated by the other states of the country^[14, 37-41] and world^[42-44]. But there are some plant species which are used for treating a disease by the people of Kendrapara district but the same plant is used by other communities of the country for treating different diseases. Examples include;

Ageratum conyzoides L. is used for wound by the folk communities of Kumaun Himalaya^[45]; whole plant of *Argemone mexicana* L. is fed with any available local grass once a day for removal of retained placenta^[18]; the leaves of *Bambusa arundinacea* (Retz.) Willd. are fed to animal to expel placenta after delivery^[46]; whole plant of *Boerhavia diffusa* L. is fed twice a day for removal of retained placenta; flower of *Madhuca indica* Gmel. is used for oral ulcer by the tribals of Maharastra^[47]; leaves of the plant *Momordica charantia* L. mixed with salt is given after delivery for the easy removal of placenta^[48]; bark of *Terminalia bellirica* (Gaertn.) Roxb. is used against foot and mouth disease by the people of Gujarat^[49]; powdered leaves of *Terminalia arjuna* (Roxb.ex DC.) Wight & Arn. is used for digestive disorder and diarrhea and leaves of *Ziziphus mauritiana* Lam. Against skin disease are used by the people of Garhwal, Uttarakhand^[50, 51]. These uses of plants provide credibility of folk claims and clues for pharmacological screening.

Table 1: Plant species used in ethnoveterinary practices in Kendrapara district, Odisha

Botanical name, family & local name	Parts used	Disease/condition	Mode of application
<i>Acanthus ilicifolius</i> L. Acanthaceae, 'Harcancha'	Leaf	Bone fracture	Paste prepared from leaf is applied on the affected area of the animal with support by means of bamboo pieces.
<i>Achyranthes aspera</i> L. Amaranthaceae, 'Apamaranga'	Whole plant	Bone fracture, galactagogue	Whole plant of about 500g is given to cattle for galactagogue (increasing the amount of milk production in cow). A piece of fresh root is grounded and the paste applied to cure bone fracture
<i>Acorus calamas</i> L. Araceae, 'Bacha'	Rhizome	Dirrohaea	About 500g of root stock pounded with 50g rock salt, mixed with 100 ml of water, and is given in dirrohaea twice daily till cured.
<i>Ageratum conyzoides</i> L. Asteraceae, 'Poksunga'	Leaf	Sore	Juice of crushed leaves mixed with 'Karpura' is applied to cure sores on leg and toes.
<i>Alstonia scholaris</i> (L.) R. Br. Apocynaceae, 'Chatuan'	Stem	Diarrhea	Crushed stem bark mixed with cattle feed is to cow to cure diarrhea.
<i>Amaranthus spinosus</i> L. Amaranthaceae, 'Kanta saga'	Whole plant	Lactation	Whole plant prescribed as cattle feed for milking cattle to increase lactation. Whole plant decoction is given to cattle against delivery complaints.
<i>Anacardium occidentale</i> L. Anacardiaceae. 'Saitamba'	Bark	Broken horn	Bark of the <i>Anacardium occidentale</i> is grounded with equal amount of leaves of <i>Leucas aspera</i> , gently warmed and paste bandaged with clean cotton cloth around the effected area till cure.
<i>Areca catechu</i> L. Arecaceae, 'Gua'	Nuts	Worms	3 nuts are soaked over night in one glass of water and this is given to the cattle to kill the worms.
<i>Argemone mexicana</i> L. Papaveraceae, 'Kanta kusuma'	Root	Eczema	Crushed roots are applied over body for the treatment of eczema in domestic animals.
<i>Bambusa arundinacea</i> (Retz.) Willd. Poaceae, 'KantaBaunsa'	Leaf	Blood dysentery	Finely cut leaves are fed to the cattle twice a day for three days to control blood dysentery.
<i>Barringtonia acutangula</i> (L.) Gaertn. Barringtoniaceae	Leaf	Dysentery	Crushed leaves with rice mend to treat dysentery of cow.
<i>Boerhavia diffusa</i> L. Nyctaginaceae, 'Puruni'	Whole plant	Inflammation	The whole plant is boiled with water 50 ml of this water juice is given orally for two times per day to 5-6 days to treat inflammation in cattle.
<i>Cajanus cajan</i> (L.) Mill. Fabaceae, 'Harada'	Leaf	Ulcer	Green pods grinded and mixed with water is given twice daily for dysentery.
<i>Calotropis gigantea</i> R.Br. Asclepiadaceae, 'Dhalaarakha'	Leaf	Skin diseases	Dried leaves of <i>Calotropis gigantea</i> R.Br., turmeric (<i>Curcuma longa</i> L.) powder and Karanj (<i>Pongamia pinnata</i> (L) Pierre.) oil in a ratio of 5:2:2 are mixed and boiled to form a cream and applied for treatment of eczema and other skin infections.
<i>Carissa opaca</i> Stapf. ex.Haines. Apocynaceae, 'Khirkoli'	Root	Killing of insects	The juice of the root is applied for the expulsion or killing insects from the body of the cattle.
<i>Chenopodium album</i> L. Chenopodiaceae, 'Bathuasaga'	Whole plant	Dysentery	Whole plant is crushed and the extracted juice is given to animal for dysentery.
<i>Cissus quadrangularis</i> L. Vitaceae, 'Hadbhanga'	Stem and Leaf	Bone fracture	The leaf and stem paste is plastered over bone area and bandaged till the bone sets in cattle.
<i>Clitoria ternatea</i> L. Fabaceae, 'Aparajita'	Leaf	Dysentery	Leaf paste of 100g was mixed with 25g jiggery and 500 ml buttermilk and given orally once a day for three days.

<i>Coccinia indica</i> Wight & Arn. Cucurbitaceae	Leaf	Cold	Warm leaf juice with the juice of ginger and garlic given twice to cattle to cure cold.
<i>Datura stramonium</i> L. Solanaceae, 'Dhaladudura'	Leaf	Wound	Fresh leaf juice is applied for removing maggot from wounds of cattle.
<i>Gossypium herbaceum</i> Mast. Malvaceae	Whole plant	Skin	It is burnt and its black mass is collected after the flame and applied topically over cattle.
<i>Holarrhena antidysenterica</i> Wall. ex A. DC. Apocynaceae	Bark	Dysentery	About 20g stem bark powder or decoction is given thrice daily to livestock to treat constipation, problems during stool passing and dysentery.
<i>Lantana camara</i> L. Verbenaceae, 'Nagaairi'	Leaf	Blood clotting	Leaf juice is applied for quick blood clotting.
<i>Leucaena glauca</i> Benth. Mimosaceae	Leaf	Diarrhea	Leave mixed with cattle feed to treat diarrhea.
<i>Lippia javanica</i> (Burm.f.) Spreng. Verbenaceae	Whole Plant	Wounds	Plant made into paste and mixed with cow dung applied on wounds of cattle.
<i>Madhuca indica</i> Gmel. Sapotaceae, 'Mahula'	Flower	Wound	Boiled flowers are tied on injured part of body to cure wounds.
<i>Mentha spicata</i> L. Lamiaceae, 'Podina'	Leaf	Fever	About 200g leaves are crushed with water and boiled to prepare decoction. Two cups of decoction is given thrice daily to treat mild fever.
<i>Momordica charantia</i> L. Cucurbitaceae, 'Kalara'	Whole plant	Skin	The whole plant of <i>Momordica charantia</i> L. with a piece of <i>Cinnamon</i> , 5-6 long peppers (<i>Piper longum</i> L.), handful of rice (<i>Oryza sativa</i> L.) and 4-5 teaspoonful of karanj or neem oil is ground together to prepare a cream. The cream is applied for scabies, psoriasis and common skin itches.
<i>Morus alba</i> L. Moraceae, 'Resmi'	Fruit, leaf	Mastitis	Decoction of fruit and leaf is given once daily for three days against mastitis.
<i>Mucuna pruriens</i> L. Fabaceae, 'Baidanka'	Leaf	Wounds	Leaf paste mixed with turmeric is applied locally to cure wounds.
<i>Opuntia dillenii</i> Haw. Cactaceae, 'Nagapheni'	Fruits	Diarrhoea	The fruits are made into juice 100 ml of this juice is given orally for two times per day to 3-4 days to cure diarrhoea in sheep's and goats.
<i>Oroxylum indicum</i> (L.) Vent. Bignoniaceae, 'Phanaphania'	Seeds	Wound	Grinded seeds fried with mustard oil are applied on wound or cracks on the nipples twice daily till cured.
<i>Pongamia pinnata</i> (L.) Pierre. Fabaceae, 'Karanj'	Seed	Ringworm	A mixture of phosphorous powder and seed oil of <i>Pongamia pinnata</i> is given for ringworm.
<i>Psidium guajava</i> L. Myrtaceae, 'Pijuli'	Leaf	Dysentery	Fresh leaf decoction is given to animal to cure dysentery.
<i>Saraca asoca</i> (Roxb.) de Wilde. Cesalpiniaceae, 'Ashoka'	Leaf, stem bark	Fertility	Decoction of leaf and stem bark is administered once daily for ten days against to induced fertility.
<i>Scindapsus officinalis</i> (Roxb.) Schott. Araceae	Fruit	Infected wounds	Powdered fruit mixed with edible oil is applied locally on infected wounds to expel worms.
<i>Scirpus articulatus</i> L. Cyperaceae, 'Gaichira'	Whole Plant	Increase lactation	Plant prescribed as cattle feed for mulching cattle to increase lactation.
<i>Sesamum indicum</i> L. Pedaliaceae, 'Khasa'	Seed	Lactation	Seeds mixed with jiggery and edible oil is fed daily to increase cattle lactation. Oil mixed with turmeric powder is boiled, cooled and is applied on the affected part on horn wound.
<i>Swertia angustifolia</i> Buch.-Ham, ex.D.Don. Gentianaceae	Whole plant	Wound	It is boiled in Rasitel (<i>Sesamum indicum</i> L.) in low flame. After evaporation of all water contain, then the oil is collected and filtered and applied to animal topically over the wound.
<i>Syzygium cumuni</i> L. Skeels Myrtaceae, 'Jamu'	Seed, stem bark	Stomach trouble	Seed, stem bark powder mixed with water is boiled for some time, is given to animals for stomach trouble.
<i>Terminalia arjuna</i> (Roxb.ex DC.)Wight&Arn. Combretaceae, 'Arjuna'	Bark	Wound	Stem bark infusion is used as disinfectant to cleanse infected wound of farm animals.
<i>Terminalia bellirica</i> (Gaertn.) Roxb. Combretaceae 'Bahada'	Fruit	Dysentery	About 100g of fruit are crushed with water and boiled to prepare decoction. It is administered thrice daily to livestock for treatment of diarrhea and dysentery.
<i>Trachyspermum ammi</i> (L.) Sprague. Apicaceae, 'Juani'	Seed, leaf	Stomach pain	Seeds and leaves mixed with salt are fed against general stomach pain.
<i>Zizyphus mauritiana</i> Lam. Rhamnaceae, 'Barakoli'	Root	Cuts and wounds	Root paste is applied on cuts and wounds for quick healing.

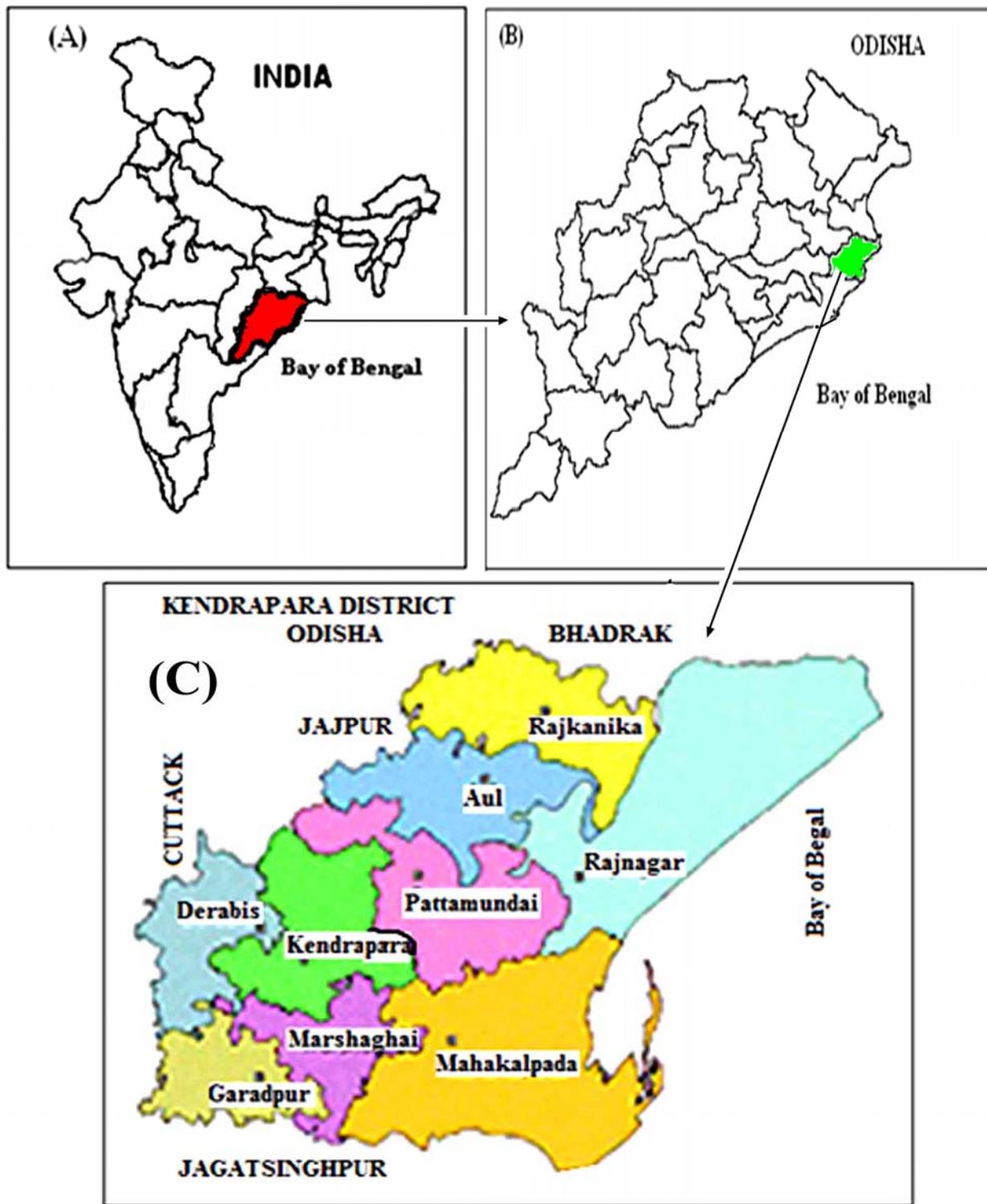


Fig. 1 (A) Location of the Odisha state in the eastern region of India, (B) map of the Odisha state (C) study area showing different blocks of the Kendrapara district.



Fig.2.a. *Acanthus ilicifolius* L. **b.** *Achyranthes aspera* L. **c.** *Alstonia scholaris* (L.) R. Br. **d.** *Argemone mexicana* L. **e.** *Boerhavia diffusa* L. **f.** *Calotropis gigantea* R.Br. **g.** *Chenopodium album* L. **h.** *Cissus quadrangularis* L. **i.** *Coccinia indica* Wight & Arn. **j.** *Lantana camara* L. **k.** *Lippia javanica* (Burm.f.) Spreng. **l.** *Madhuca indica* Gmel. **m.** *Opuntia dillenii* Haw. **n.** *Pongamia pinnata* (L.) Pierre. **o.** *Saraca asoca* (Roxb.) de Wilde. **p.** *Sesamum indicum* L. **q.** *Syzygium cumuni* L. Skeels. **r.** *Terminalia arjuna* (Roxb.ex DC.) Wight & Arn. **s.** *Terminalia bellirica* (Gaertn.)Roxb. **t.** *Zizyphus mauritiana* Lam.

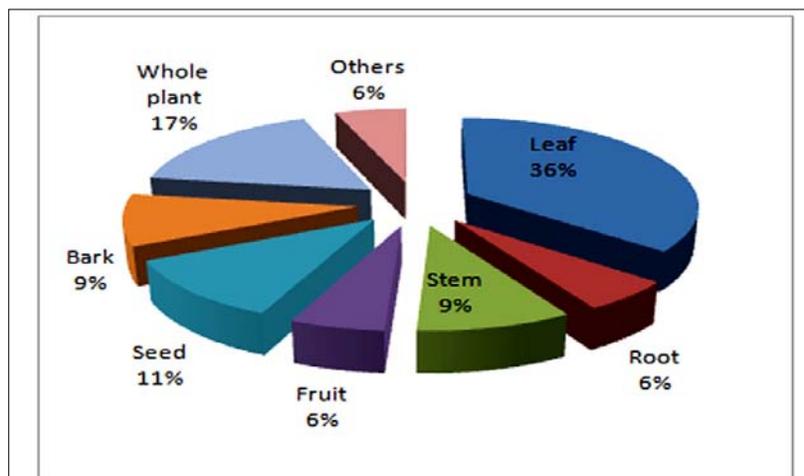


Fig.3. Percentage of plant parts used in preparing ethnoveterinary medicines.

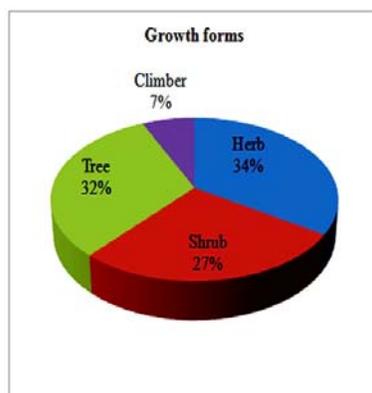


Fig.4. Growth form analysis.

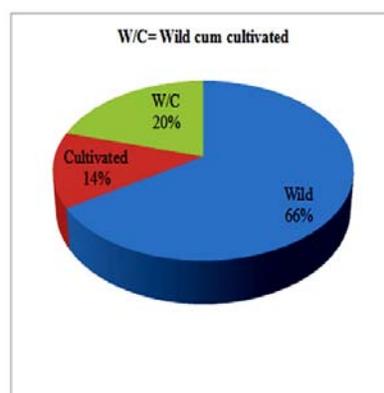


Fig.5. Distribution of wild, cultivated and wild-cum-cultivated plants used in ethnoveterinary medicines.

Conclusion

Traditional medicine offers natural ways to treat disease and promote health. Therapies of western medicine carry the risk of adverse effects and are often too costly especially for the developing country like India, where ethnic as well as environment also differ. In this paper we have focused herbal medicines and their key functions, which are the main source of modern medicine and that, may be helpful for the treatment of various ailments of animals as well as to the scientists, scholars, veterinary professionals who are working on this aspect.

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