Full Length Research Paper

Tribal way to treat diabetes: Potentials of traditional phytotherapy in the ethnic belts of purulia district, India and socio-economic relevance

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Accepted 11 March, 2013

Plants have been used by the human beings since time immemorial. Purulia a district located at the western part of the state West Bengal, India is known for its aboriginal elements with diverse socio-economic and cultural backgrounds. In surveys conducted among the tribal villagers, it was found that, a strong ethnobotanical system prevails in the area for the treatment of various ailments of humans and livestock. Diabetes mellitus is not a very common threat to the people residing here but the increasing tendency to westernization and ever changing food habit may contribute to the disease in the near future. The present survey enlists a number of 32 medicinal plants belonging to 18 plant families with potentials to be used as antidiabetics. These plants are used in the treatment of other ailments and the knowledge regarding the antidiabetic principles of certain herbal preparations may be incorporated in the age old tribal practices.

Key words: Diabetes mellitus, ethnobotany, pharmacology, antidiabetic, socio-economic.

INTRODUCTION

Ethnobotany has always provided valuable information regarding human use of botanicals. The age old dependence of man on plants for food, fodder, fiber, fuel and medicine has not only helped human civilization to flourish, but the present day scientific analyses have provided useful tools to evaluate the efficacy of the botanicals. Folkloric use of plants has indicated the medicinal potential of certain herbal formulations. Pharmacological evaluation of medicinal plants has provided useful information on plants used as antibacterial (Dey et al., 2011; Mukherjee et al., 2012), antifungal (Dey and De, 2011b), anti-mycobacterial (Dey and De, 2012c), anti-cancerous (Bhakuni et al., 1976), antioxidative (Dey and De, 2012e), antiphidian (Dey and De, 2012f), anti scorpion venom (Dey et al., 2013), antidiabetic (Patel et al., 2012) and many other properties.

Medicinal plants are reported to possess antidiabetic activities (Grover et al., 2002). Botanicals show antidiabetic principles in terms of their antioxidative (Sabu and Kuttan, 2002), α-amylase inhibitory (Kotowaroo et al., 2006), α-glucosidases inhibitory (Onal et al., 2005), anti-hyperglycemic (Alarcon-Aguilara et al., 1998) and hypoglycemic (Ojewole, 2005) properties. Ethnobotanical surveys in search of antidiabetic plants have been carried out at different parts of the globe, such as in Nigeria (Abo et al., 2008; Gbolade, 2009), Morocco (Jouad et al., 2001), Canada (Leduc et al., 2006), Mexico (Hernandez-Galicia et al., 2002), Trinidad and Tobago (Lans, 2006) etc. In India, Sikkim and Darjeeling Himalaya (Chhetri et al., 2005), Assam (Tarak et al., 2011), Arunachal Himalaya (Tag et al., 2012) etc have been surveyed. Earlier, several investigations have been carried out in the district of Purulia in search of medicinal plants used against gastrointestinal disorders (Dey and De, 2012a), snakebite (Dey and De, 2012b) and other ailments and as remedy for pediatric, maternal (Dey and De, 2011a) and veterinary (Dey and De, 2010) ailments. The present work represents a documentation of indigenous flora of
Table 1. Potential anti diabetic medicinal plants as used by the tribals of Purulia district against other disorders

<table>
<thead>
<tr>
<th>Scientific name</th>
<th>Family</th>
<th>Vernacular name</th>
<th>Reporting area</th>
<th>Anti-diabetic references</th>
</tr>
</thead>
<tbody>
<tr>
<td>Abutilon indicum (L.) Sweet</td>
<td>Malvaceae</td>
<td>Jhampi</td>
<td>Saspur</td>
<td>Seetharam et al., 2002</td>
</tr>
<tr>
<td>Achyranthes aspera L.</td>
<td>Amaranthaceae</td>
<td>Chip chirit</td>
<td>Tandapania</td>
<td>Akhtar and Iqbal, 1991</td>
</tr>
<tr>
<td>Aegle marmelos (L.) Corrèa</td>
<td>Rutaceae</td>
<td>Bel</td>
<td>Ajodhya</td>
<td>Sabu and Kuttan, 2004; Narendhirakannan and Subramanian, 2010</td>
</tr>
<tr>
<td>Andrographis paniculata (Burm. f.) Wall. ex Nees</td>
<td>Acanthaceae</td>
<td>Mahatita</td>
<td>Poradi</td>
<td>Zhang and Tan, 2000; Nugroho et al., 2012</td>
</tr>
<tr>
<td>Azadirachta indica A. Juss.</td>
<td>Meliaceae</td>
<td>Nim</td>
<td>Para</td>
<td>Khosla et al., 2000; Gutierrez et al., 2011</td>
</tr>
<tr>
<td>Bombax ceiba L.</td>
<td>Malvaceae</td>
<td>Simbali</td>
<td>Puncha</td>
<td>Saleem et al., 1999</td>
</tr>
<tr>
<td>Calotropis procera (Aiton) W.T. Aiton</td>
<td>Apocynaceae</td>
<td>Chhota akaon</td>
<td>Jhalda</td>
<td>Rahmatullah et al., 2009</td>
</tr>
<tr>
<td>Carica papaya L.</td>
<td>Caricaceae</td>
<td>Pipa</td>
<td>Kashipur</td>
<td>Maniyar and Bhiyavatimath, 2012</td>
</tr>
<tr>
<td>Cuscuta reflexa Roxb.</td>
<td>Convolvulaceae</td>
<td>Alak jari</td>
<td>Pakarnala</td>
<td>Rahmatullah et al., 2009</td>
</tr>
<tr>
<td>Datura metel L.</td>
<td>Solanaceae</td>
<td>Dhatra</td>
<td>Jhalda</td>
<td>Krishna Murthy et al., 2004</td>
</tr>
<tr>
<td>Dolichos biflorus L.</td>
<td>Fabaceae</td>
<td>Anrsga</td>
<td>Santuri</td>
<td>Pant et al., 1968</td>
</tr>
<tr>
<td>Emblica officinalis Gaertn.</td>
<td>Euphorbiaceae</td>
<td>Miral</td>
<td>Sharbarya</td>
<td>Akhtar et al., 2011</td>
</tr>
<tr>
<td>Euphorbia hirta L.</td>
<td>Euphorbiaceae</td>
<td>Ara dudhi</td>
<td>Puncha</td>
<td>Kumar et al., 2010; Subramanian et al., 2011</td>
</tr>
<tr>
<td>Ficus benghalensis L.</td>
<td>Moraceae</td>
<td>Bor</td>
<td>Tandapania</td>
<td>Kar et al., 2003</td>
</tr>
<tr>
<td>Ficus racemosa L.</td>
<td>Moraceae</td>
<td>Gular</td>
<td>Kashipur</td>
<td>Bhaskara et al., 2002; Sophia and Manoharan, 2007</td>
</tr>
<tr>
<td>Gymnema sylvestre (Retz.) R. Br. ex Schult.</td>
<td>Apocynaceae</td>
<td>Merasingi</td>
<td>Santuri</td>
<td>Yadav et al., 2010; Kang et al., 2012</td>
</tr>
<tr>
<td>Holostemma annularis K. Schum.</td>
<td>Apocynaceae</td>
<td>Apung</td>
<td>Dhabani</td>
<td>Reddy et al., 2010</td>
</tr>
<tr>
<td>Ichnocarpus frutescens (L.) W.T. Aiton</td>
<td>Apocynaceae</td>
<td>Piri hore</td>
<td>Jhalda</td>
<td>Barik et al., 2008; Kumarappan and Mandal, 2008</td>
</tr>
<tr>
<td>Mangifera indica L.</td>
<td>Anacardiaceae</td>
<td>Aam</td>
<td>Jaipur</td>
<td>Ojewole, 2005</td>
</tr>
<tr>
<td>Mucuna pruriens (L.) DC.</td>
<td>Fabaceae</td>
<td>Etka</td>
<td>Manbazar</td>
<td>Pant et al., 1968; Bhaskar et al., 2008</td>
</tr>
<tr>
<td>Neolamarckia cadamba (Roxb.) Bosser</td>
<td>Rubiaceae</td>
<td>Kadam ba</td>
<td>Dhabani</td>
<td>Ahmed et al., 2011</td>
</tr>
<tr>
<td>Pterocarpus marsupium Roxb.</td>
<td>Fabaceae</td>
<td>Bija-sal</td>
<td>Matha</td>
<td>Mukhtar et al., 2005; Dhanabal et al., 2006</td>
</tr>
<tr>
<td>Rauvolfia serpentina (L.) Benth. ex Kurz</td>
<td>Apocynaceae</td>
<td>Chhota chand</td>
<td>Jhalda</td>
<td>Qureshi et al., 2009</td>
</tr>
<tr>
<td>Scoparia dulcis L.</td>
<td>Plantaginaceae</td>
<td>Koara</td>
<td>Baliguma</td>
<td>Pari and Latha, 2004, 2005</td>
</tr>
<tr>
<td>Solanum xanthocarpu Schrad. &amp; H. Wend.</td>
<td>Solanaceae</td>
<td>Bhigibaigan</td>
<td>Tandapania</td>
<td>Poongothai et al., 2011</td>
</tr>
<tr>
<td>Tamarindus indica L.</td>
<td>Fabaceae</td>
<td>Imla</td>
<td>Ghatbera</td>
<td>Maiti et al., 2004, 2005</td>
</tr>
<tr>
<td>Terminalia belerica Roxb.</td>
<td>Combretaceae</td>
<td>Bahra</td>
<td>Santuri</td>
<td>Sabu and Kuttan, 2009</td>
</tr>
<tr>
<td>Tinospora cordifolia (Willd.) Miers</td>
<td>Menispermaceae</td>
<td>Gurchi</td>
<td>Tandapania</td>
<td>Patel and Mishra, 2011</td>
</tr>
<tr>
<td>Zingiber officinale Roscoe</td>
<td>Zingiberaceae</td>
<td>Ade</td>
<td>Jhalda</td>
<td>Islam and Choi, 2008; Rani et al., 2012</td>
</tr>
</tbody>
</table>
the district with potential to be used as antidiabetic plants as indicated by the literature.

MATERIALS AND METHODS

Study area

Purulia, the westernmost district of West Bengal is known for its extreme weather, reduced rainfall, undulated topography and underdeveloped agriculture. The district is located within 22°51’ N and 23°42’ N and 85°51’ E and 86°54’ E and covers an area of 6529 sq km (Dey and De, 2011a) and is represented by many hills and hillocks. Strong representation of tribal elements with diverse socio-cultural background is another characteristic feature of the district. The main tribal groups residing in the district are Santhal, Oraon, Munda, Birhor, Kharia, Bhumija, Kharwar, Gond, Mal Paharya and Ho (Dey and De, 2011a). They mostly live in close proximity to nature especially in rural villages and dense forests. Due to lack of a developed agricultural system, the rural people mostly depend on forests as their major resource to sustain their livelihood. The authors have noted a strong traditional ethnobotanical knowledge prevailing among the tribals which has been passed through generations with no or slight changes.

Survey

Preliminary surveys were conducted to document the ethnobotanical wealth of the district. The timing was chosen on the basis of flowering of different plants during various seasons throughout the year. During our investigations at different seasons of the year, survey camps were arranged and the informative villagers were selected on the basis of their consent and knowledge and they were designated as informants. Following the selection of 36 traditional healers as informants, standard ethnobotanical procedure was followed as described by Dey and De, 2011a. The informants were taken to the field to verify their ethnomedicinal claims of respective plants and the data was documented accordingly. Common plants were taken for preservation and the rare plants were photographed in their natural habitat. The plants were identified scientifically from the flora of the district and the surrounding areas (Prain, 1903; Paria and Chattopadhyay, 2000, 2005).

RESULTS

A total number of 32 of medicinal plants belonging to 18 plant families as reported by the tribals to have therapeutic value are listed in Table 1 with their scientific name, family, vernacular name and reporting area. The existing scientific databases were searched thoroughly to decipher the pharmacological basis of anti-diabetic properties of certain botanicals used by these tribes as remedies of various diseases. Among the plant families, Apocynaceae (6) represents the most prevalent one, followed by Fabaceae (5), Malvaceae, Convolvulaceae, Solanaceae, Euphorbiaceae and Moraceae (2 each) (Figure 1) where the number in the parenthesis indicates the number of reported plants within each family.
DISCUSSION

The results seem to be interesting considering the tribal lifestyle and herbal healing. Diabetes mellitus has been reported as a disease related to lifestyle and obesity (Youssef and McCullough, 2002). Consumption of high caloric diet (Roy and Janal, 2010), hypertension (Hamilton, 1990) and lack of physical exercise (Ansari, 2009) are among the many causes of this present day menace. For the past several years the authors have been associated with the tribal use of medicinal plants in this area and they have found little or no occurrence of diabetes mellitus among them, until recently one or two cases have been reported. Lack of affinity to the high caloric foods due to poverty and physical labor could be the reasons behind the negligible prominence of the disease in the rural areas of the district. However, the authors have also noted the infiltration of western culture and food habit among the new generations. Urban livelihood is also attracting the young people as a result of which the lifestyle related diseases are likely to appear sooner or later. Moreover, tribal folklore has been practiced since ancient times and diabetes was not prevalent in the past. Therefore, the knowledge which is mostly transferred horizontally from ancestors to the present does not provide a significant knowledge regarding the traditional herbal remedies against diabetes. It was noted by the authors that some of the reported botanicals possess potential antidiabetic activities as supported by the existing literature, and these are used by the tribals to treat other ailments which may be indirectly related to the cure of diabetes. For example, such plants are reported to treat wounds and possess anti-inflammatory and antioxidative properties. Consumption of such plant preparations as monotherbal or polyherbal formulations may have been providing them the antidiabetic properties from ancient times. The importance of such plants as antidiabetic agents must be conveyed to the rural tribal medical practitioners who may add the information to the pre-existing ethnomedicinal wealth practiced by them.

CONCLUSION

Due to high price, side effects and the development of drug resistance in case of synthetic drug use, a large segment of the human population is practicing the use of alternative and complementary methods of remedy and herbal treatments represent one of them. A vast majority of rural people, especially the underprivileged of the developing countries depend on plant based medicine for their regular healthcare. Although, diabetes mellitus is mostly concentrated in the urban areas, reports reveal that the rural people are also facing this danger in the near future. Medicinal plants are reported to possess antidiabetic principles either in crude preparations or as isolated compounds. Awareness among the tribals regarding the possible therapeutic value of certain plants as hypoglycemic agents may serve as an aid to their age long medico-botanical knowledge of using the same plants in the treatment of other diseases.

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