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Original Article

Biostatistics of Traditionally used Medicinal Plants of Almora District, Uttarakhand(India)

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Abstract

Diversity must be added to the list of factors - including species composition, disturbance regime, soil type and climate - that influence ecosystem functioning. The recent knowledge of the importance of biodiversity highlights an under-appreciated truth - although society is dependent on natural and managed ecosystems for goods and services that are essential for human survival, we know all too little about how ecosystems work. Almora district of Uttarakhand, India for the presence of plants of medicinal importance were used locally besides recorded in the ancient and modern texts. During the survey, 187 ethno medicinal plants have been studied. Clustering, Correlation and liner regression has been calculated, between the two variables i.e, number of diseases with number of plants with parts used. The correlation between number of diseases and number of plants with particular parts used is 0.9020. The value of correlation is 0.9020 and coefficient of variation is 0.3188. It indicates that there is high positive correlation between the two variables at 5% level of significances at 11 df. The value of regression coefficient is highly significant at 1% level of probability.

Keywords: *Almora, Cluster, Correlation, Medicinal Plants*

INTRODUCTION

Himalayan herbal medicine and their traditional knowledge is a good illustration of local communities living in these areas, fighting even incurable diseases through the traditional methods, and even for their livestock, through these traditional herbal medicines. Medicinal plants are natural resources for new drugs. Plant parts are directly used as medicines by a majority of community in all over world and have no side effect like allopathic medicines. Most of the modern medicines are produced indirectly from medicinal plants. The Himalaya region has played an important role with restricted habitats of many valuable medicinal plant species (Kala *et al*. 2004). The inhabitants of Uttaranchal are still dependent on the traditional knowledge (practitioners of Ayurveda) for treating diseases due to isolation and relatively poor access to modern medical facilities (Dhyani & Kala 2005, Kala 2000, 2005).

The Almora district lies between 29°30'N to 30°20'N latitudes and 79°20' E to 80°20'E longitudes. It is located in the central part of kumaun region of Uttarakhand (India) (Figure 1: Map of Almora district). Almora District is characterized by a rich diversity of ethno-medicinal plants as well as a rich heritage of traditional medicine system (Kumari et al 2011). Due to great
altitudinal variation, wide array of climatic zones are available, which favors the luxuriant growth of diversified and rich vegetation which also has a number of raw drugs described in Ayurvedic texts. The value of biodiversity as a source of pharmaceutically important substances has been the subject of a number of studies, such as Farnsworth and Soejarto (1985), McNeely (1988), Principe (1991) and Pearce and Puroshothaman (1992), while documentation on ethno-botanical knowledge was done by Maikhuri et al. (2000), Nautiyal et al. (2001).While a comprehensive review has described a rich diversity and use of

medicinal flora within Uttarakhand (Joshi, 2002), besides a study conducted on the medicinal plant diversity in riparian zone of River Ganga at Haridwar (Gangwar and Joshi, 2006) to understand the use of plant species from Himalayan region to cure various ailments. The present manuscript discuss the biostatistics of traditionally used medicinal plants relating the two variables i.e, number of diseases with number of plants with parts used of Almora district.

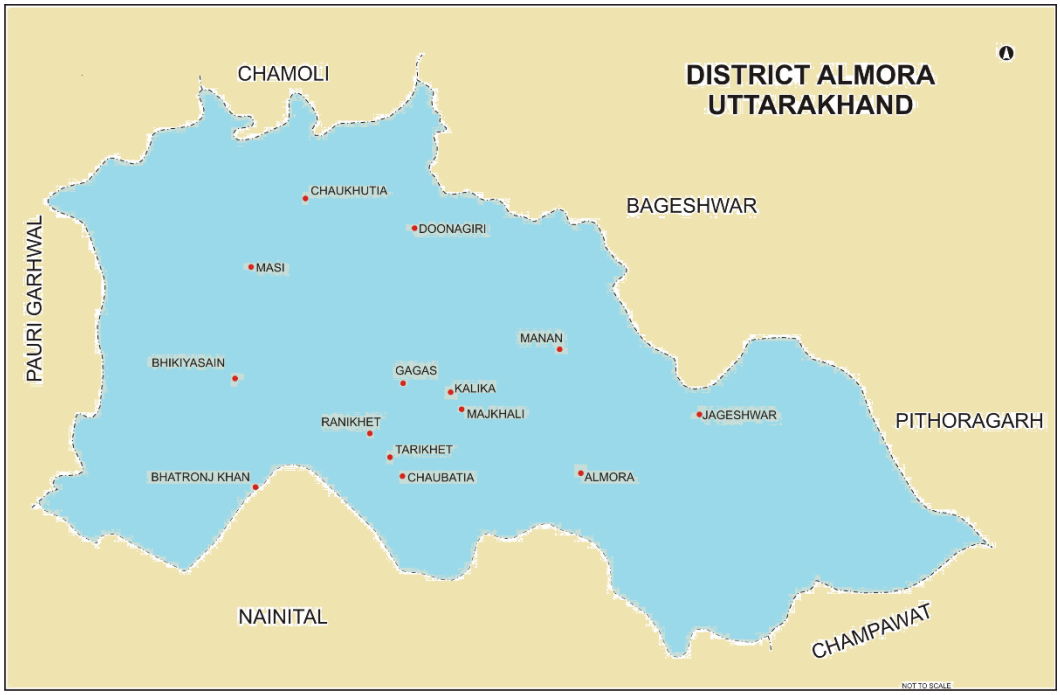

Fig1. Map of Almora district

MATERIAL AND METHODS

The present study was based on a field survey of Almora district of Uttarakhand (India) under central Himalaya, to find the plants of medicinal values. The work was conducted among local people, rural persons, farmers and *Vaidyas* to know the local names and medicinal importance of mentioned plants. The plants with medicinal values, as known from local people and rural persons were collected and studies were made to know their medicinal uses. These peoples are apparently very friendly but maintained a deep secrecy about their traditional knowledge. However, after visiting them for several times after developing confidence, they finally shared their knowledge about the medicinal uses of plants growing around them. For collecting the information, an interview schedule was developed. A flexible approach was adopted by using a less structural interview schedule. Data were collected through interview of randomly selected peoples of Almora district. The plant species were indentified and verified in Regional Research Institute of Himalayan Flora, Tarikhet, Uttarakhand (India). The status of the ethno-medicinal plants was compared with IUCN Red list. Clustering, Correlation and liner regression has been calculated with the help of NCSS 2007 software, between the two variables i.e, number of diseases with number of plants with parts used.

Results and discussion

During the field survey, out of 187 ethno medicinal plants found, 50 plants uses as whole plant in 28 diseases, stem of 7 plants in 15 diseases, root of 41 plants in 35 diseases, leaves of 35 plants in 31 diseases, latex of 2 plants in 2 diseases, bulb of 7 plants in 9 diseases, seed of 23 plants in 29 diseases, bark of 16 plants in 21 diseases, fruit of 26 plants in 28 diseases, rhizome of 6 plants in 9 diseases, flower of 9 plants in 10 diseases, inflorescence of 2 plants in 3 diseases and resin of 1 plants in 2 diseases. The results obtained have been biostatistically analyzed. Correlation and liner regression has been calculated between the two variables i.e, number of diseases with number of plants with parts used (Figure 2). In this study Y = (C3) Number of diseases (dependent variable) and X = (C2) Number of plants with particular parts used (Independent variable). The equation of the straight line relating number of disease and number of plants with particular parts used is estimated as: Number of disease = (5.5303) + (0.6671). Number of plants with particular parts

No. of disease

used using the 13 observations. The y-intercept, the estimated value of number of disease, when number of plants with particular parts used is zero, is 5.5303 with a standard error of 2.2491. The slope, the estimated change in number of disease per unit change in number of plants with particular parts used, is 0.6671 with a standard error of 0.0963. The value of R-squared, the proportion of the variation in number of disease that can be accounted for by variation in number of plants with particular parts used, is 0.8135.

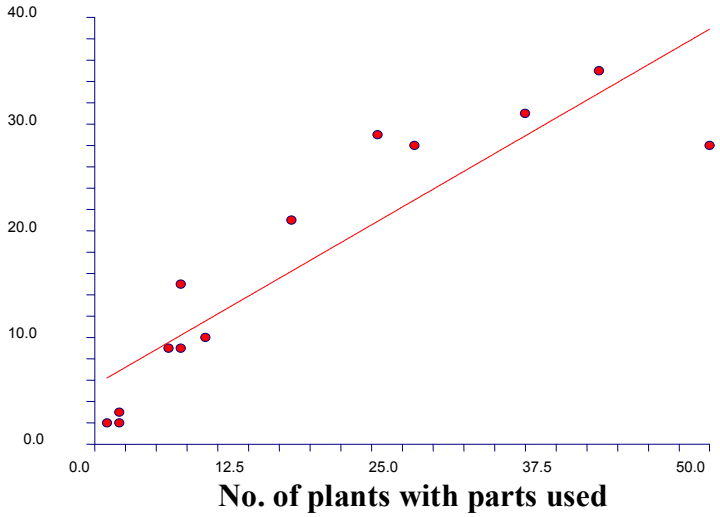

Fig 2. Correlation between number of disease and number of plants with parts used

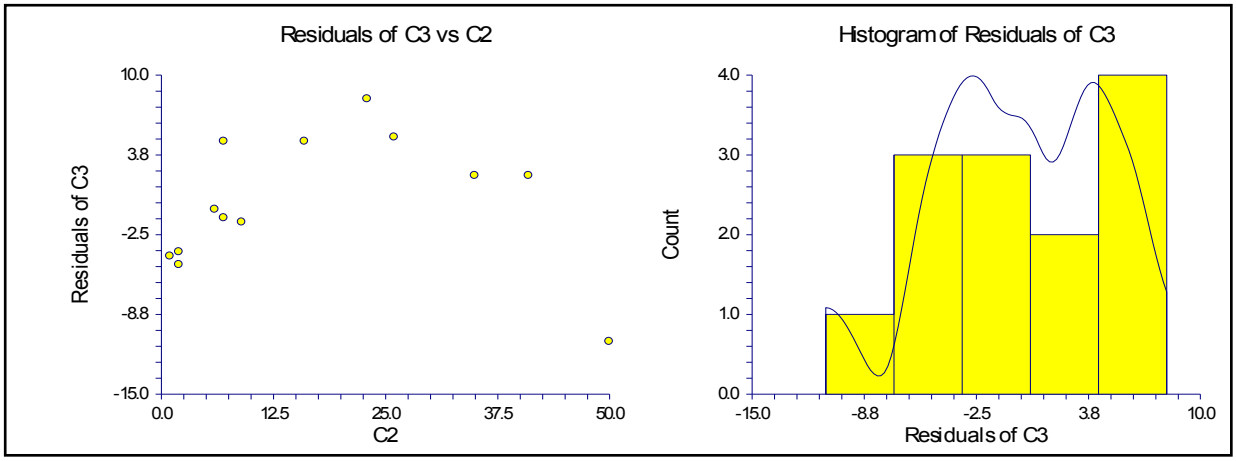

Fig 3. Scattered and histogram of number of disease and number of plants with parts used

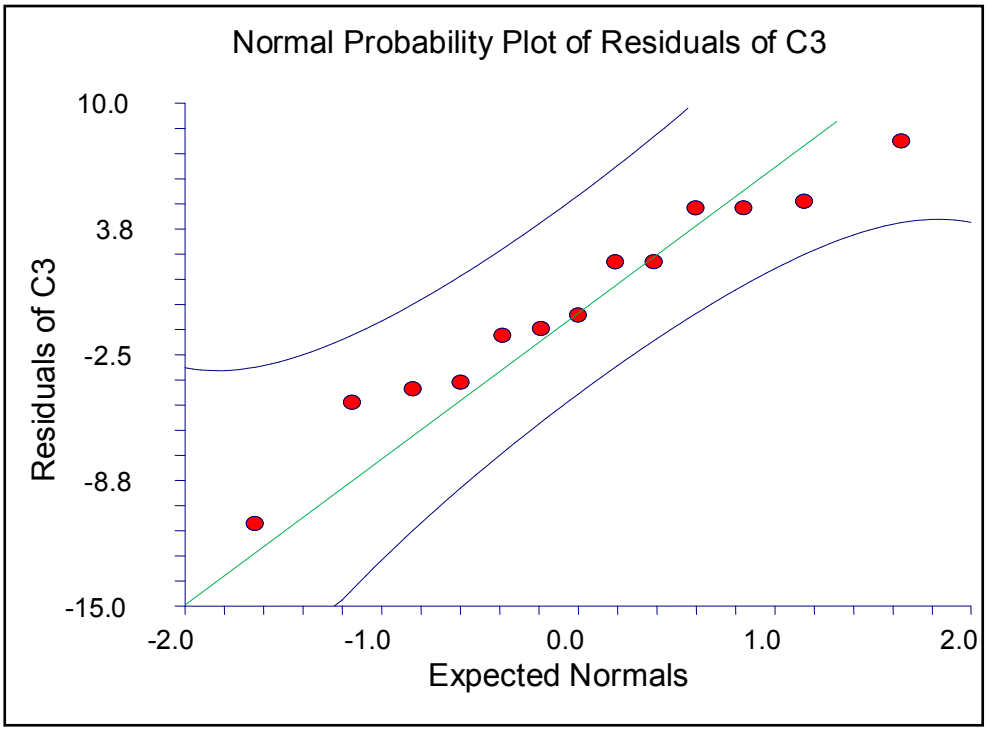

Fig 4. Regression correlation of number of disease with number of plants with parts used

The correlation between number of diseases and number of plants with particular parts used is 0.9020. The value of correlation is 0.9020 and coefficient of variation is 0.3188 (Figure 2 to 4). It indicates that there is high positive correlation between the two variables at 5% level of significances at 11 df. So, when the number of plants parts (which is used in different diseases) increases the number of formulation is also increases for those particular plants. The tabulated value is less than the calculated value; the value of regression coefficient is highly significant at 1% level of probability. A significance test that the slope is zero resulted in a t-value of 6.9276. The significance level of this t-test is 0.0000. Since 0.0000 < 0.0500, the hypothesis that the slope is zero is rejected. The estimated slope is 0.6671. The lower limit of the 95% confidence interval for the slope is 0.4552 and the upper limit is 0.8791. The estimated intercept is 5.5303. The lower limit of the 95% confidence interval for the intercept is 0.5799 and the upper limit is 10.4806. The value of correlation indicates that there is high positive correlation between the two variables. These results are generally comparable with the results of Medicinal Plants used by Traditional Vaidyas in Uttarakhand (C.P. Kala 2005).

On the basis of above data clustering has been done and the double dendrogram produced by grouping analysis based on the different parts used in different diseases with respect to number of plants used in study. Four clusters can be seen in Figure 5, for rows and two clusters can be seen for variable. The results demonstrate a considerable fit of the similarity and dissimilarity matrix to the estimated clustering that produce the dendrogram and the Cophenetic Correlation is 0.627517. For the entire process, complete linkage (Furthest Neighbor) of clustering Method, Distance Type-Euclidean and Scale Type-Range were selected. Total 12 links were identified. The nearest neighbour of dendrogram is 12th number cluster and the furthest neighbor of dendrogram is 1st number cluster which has highest linked areas.

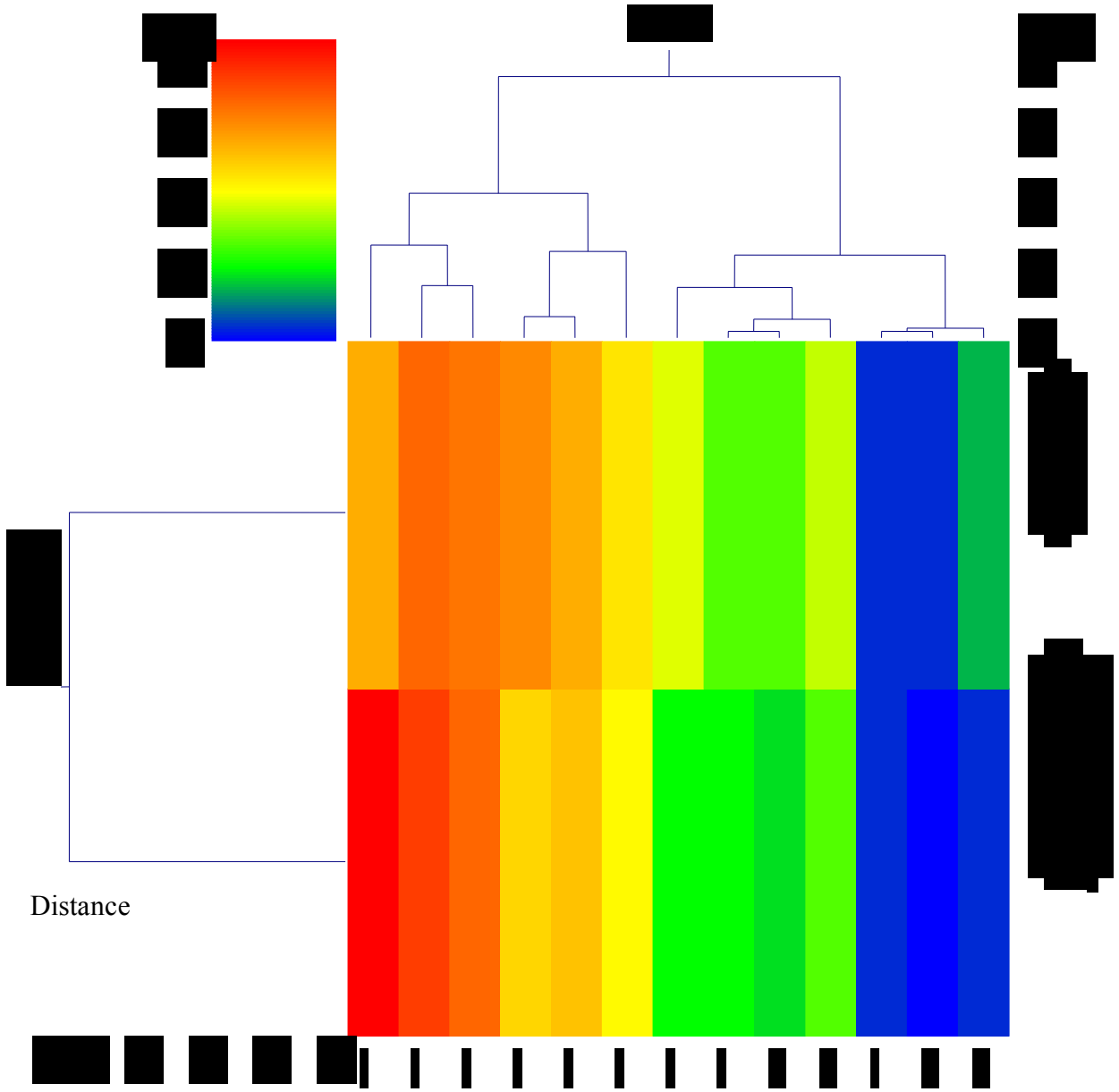

Fig 5. Double Dendrogram.

CONCLUSION

The diversity of ethno-medicinal plants is shows that 187 species of local flora is used in the traditional medicine system. The correlation between number of diseases and number of plants with particular parts used is 0.9020. The value of correlation is 0.9020 and coefficient of variation is 0.3188. It indicates that there is high positive correlation between the two variables at 5% level of significances at 11 df. The tabulated value is less than the calculated value; the value of regression coefficient is highly significant at 1% level of probability. Few of the species have been exploited to such an extent that their very existence is threatened. There are a large number of plants in this region, which can be exported on commercial scale and can be a source of income generation. It will also benefit the local inhabitants residing in the interior and remote areas. There may be many other causes of decline in traditional herbal therapies, however allopathic medicine has been blamed for superseding traditional systems of medicine (Banerjee 2002, Kala 2004). On some occasions a lack of availability of the required plant materials prevents the Vaidyas from using traditional formulations. These kinds of problems have ultimately reduced the efficacy of the herbal medical formulations and in the long run the tradition as a whole.

There are many traditional Vaidyas who claim to be able to treat chronic disorders such as chronic

gastric problems, eczema, jaundice, diabetic and migraines that do not respond well to western medicines (Banerjee 2002, Kumari et al 2011. Therefore, attempts should be made to systematically document all of the formulations prepared by traditional Vaidyas. However, the collection of such plants should preferably be done in a planned and systematic manner through experts in government organizations so that the herbal wealth is not over exploited. Due to unscientific collection and over exploitation many of the medicinal plants are on the verge of extinction. All the forest based medicinal herbs can be cultivated in congenial agro-climatic conditions under the guidance of technical experts. Most of crude medicinal plants have yet not been taken up for regular cultivation on commercial scale.

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