GIS STUDY OF THE DIVERSITY OF GINGER CULTIVATION IN INDIA

Utpala P, Johny A.K , V.A.Parthasarathy, K.Jayarajan and M.S.Madan

Ginger is reported to have originated in Southern China. Today, it is cultivated all over tropic and subtropic Asia.Ginger is grown throughout India. India is the world's leading producer and has a share of about 35% of the total world production. Of this Kerala accounts for 25 % of the total Indian production followed by Meghalaya 18 %, Arunachal Pradesh 10%, Mizoram 9%, West Bengal 8%, Tamil Nadu 7%, Orissa 4%, Andhra Pradesh 4% and Nagaland 3%. The principal importers are Middle East, USA, the UK , and the Netherlands.

Material and Methods;

The latest data of area , production and productivity (2003-2004)of ginger were collected from the Spice Board, Cochin . At the same time the varieties cultivated in the different states and the important centre of cultivation of ginger were also collected and plotted on the map. The data were plotted using DIVA GIS to study the diversity of variety and richness besides the climatic influence using the eco-crop model .To estimate the richness of the variety the most useful model of Chao 1 model was used. Where S_1 , the richness estimator is expressed as

$S_1 = S_{OBS} + (a^2 / 2b)$

Where

S_{OBS} Is the observed number of species or varieties in a sample

a= Number of observed species that are represented by only a single variety in that sample or plot.

b=the number of observed species represented by exactly two varieties in that sample or plot.

Results:

The results indicated that in the states like Bihar, Uttar Pradesh, Kashmir, Rajasthan and Maharastra are having very low area under ginger cultivation with low production. Hence these states along with Haryana and Punjab where no data is available were excluded from the studies.

A correlation study of the area and production of ginger in the different states were carried out. It was noticed that Orissa is having very high area under ginger cultivation but production is low and it varies between 3000-7000 tons. While Mizoram, Kerala and the nontraditional state Gujarath were having moderate or low area under cultivation but very high production like 30,000-46000 tone for Mizoram and Kerala and 10000-20000 tons for Gujarath respectively. The productivity levels of Tamil Nadu and Gujrat were high followed by Uttaranchal, Mizoram, Manipur and Arunachal Pradesh.(FIG-1)

The richness of varieties under cultivation of the specific states were studied. From the earlier reports following 10 varieties (table -1) were selected which are widely cultivated and having very high qualities also.(Sree Kumar 1980)

Table 1. Yield and quality attributes of selected ginger cultivars

variety	Average yield (g)	Driage (%)	Fibre (%)	Oleoresin (%)
Maran	184.4	22.8	4.3	7.2
Ernad Chernad	171.6	20.1	4.0	5.8
Assam	211.1	18.3	5.9	8.0
Wayanad Mananthody	216.6	20.1	4.8	4.8
Kurupampady	218.3	18.2	4.7	9.0
Nadia	135.5	24.5	3.6	3.0
Rio-de-Janeiro	306.6	18.0	5.8	10.8
China	268.3	17.7	4.4	4.0
Thingpuri	317.2	19.4	4.7	10.2
Wayanad local	215.0	19.4	4.7	4.9

On plotting the data in map it was found that in some states like Orissa 14 varieties are cultivated and West Bengal cultivates 9 varieties while the number of quality improved varieties are only two numbers. Though these states are having very high area under cultivation production and productivity are low. Where as Kerala, Meghalaya, Mizoram, Tamil Nadu production is good and cultivated varieties have good quality character.. Hence it can be concluded that the quality of the variety has a direct impact on the production and productivity of ginger.(fig-2)

Climate requirements

The prevailing climatic factors of the different states from where the data collected for this study were also compared. Ginger a tropical plant adopted for cultivation even in regions of sub tropical climate at high elevation. Ginger grows well in warm humid climate from sea level upto an altitude of 1500 m above MSL, optimum

elevation is 300-900m, rainfall of 3000-4000mm, grown usually under rainfed and sometimes under irrigated conditions. For successful cultivation of the crop good and well distributed rainfall is essential during the growing period, dry weather of one month prior to harvesting is required. Ginger thrives best in well drained sandy loam rich in organic matter, clayey loam with good drainage and aeration, which needs to be supplemented with organic matter

The GIS map drawn with DIVA-GIS shows that Oriissa, Mizoram, Nagaland Manipur ,Meghalaya and some parts of Arunachal Pradesh is naturally suitable for ginger .Kerala Tamil Nadu and West Bengal are not that ideal when the altitude is considered.(fig-3)

When rainfall is considered, the whole Kerala, Mizoram, Nagaland, Meghalaya, Sikkim and North Bengal are very suitable but Karnataka, Maharastra and Arunachal Pradesh are partly suitable. Orissa, Tamil Nadu, West Bengal and Andhra Pradesh are not suitable. This may be another reason for low production in Orissa and West Bengal.(fig-4).The area receiving low rainfall needs irrigation.

Diversity index of the ginger variety cultivated in India were also studied ,with the help of DIVA GIS. Diversity index is a mathematical measure of species diversity in a community. Diversity indices provide more information about community composition The Shannon diversity index (*H*) is the index that is commonly used to characterize species diversity in a community. In the present study, this was used to study varietal diversity.(fig-5)

Ginger bowl of Meghalaya is East Garo Hills followed by West Garo Hills. These two districts contribute 69% of total ginger production in Meghalaya. Ginger is grown in the hilly slopes in bun system of cultivation, as well as raised bed in plain

areas (Mohanty &Panda, 2004). The Shanno diversity index indicates the suitability of Meghalaya for ginger.

Richness of species is a key element of landscape structure because the variety of landscape elements present in a landscape can have an important influence on the variety cultivated. The study of richness is important to understand varietal diversity. The number of species (or other object) observed in an area depends to some extent on the effort invested in recording there. Because a complete census is rarely feasible, in most cases only a sample of the area was surveyed. An important problem that then arise is to estimate the total species (or other taxon) number ,$S_{max.}$ for the area. Hence an index known as Richness estimator was developed.There are almost 6 models of richness estimators. Here we have used the Chao-1 model. This estimator can give both a measure of the completeness of the inventory and also allow for better comparison with the species richness of other localities. Here in the map Fig-5 richness estimator shows Meghalaya, Mizoram north and some part of middle Assam is having variety richness, but the fig-5a where richness of variety is plotted it shows along with Meghalaya , Mizoram, and Assam the following states like Kaerla , Karnataka some parts of Tamilnadu, and North Bengal is also having species richness.

Ecocrop;

Ecocrop can be used to assist in the identification of a particular crop for defined environments. DIA-GIS implements Ecocrop to predict the adaptation of a crop over geographic areas. Currently only temperature and precipitation data are used.

In Ecocrop, the growing period is defined in days. In DIVA-GIS, 12 possible growing seasons are considered, starting at the first of each month. (In India it is 240-

270 days). 2003-2004 The Ecocrop map shows that Kerala ,Orissa, part of Mizoram, Manipur, Assam and Western part of Meghalaya, some part of North Bengal and Southern part of Arunachal Pradesh are naturally suitable for ginger cultivation.

CONCLUSION

The overall GIS study of ginger production of India indicates that most of the states which are naturally suitable for ginger cultivation are otherwise cultivating high quality varieties and having good production. But the states like Orissa and West Bengal are having better condition than Meghalaya, Uttaranchal, Tamil Nadu and Gujarat but where good quality varieties are not cultivating, hence productivity level is low.