

Adoption of Improved *Bhut Jolokia* (*Capsicum chinense*) Cultivation Practices by Farmers of the Upper Brahmaputra Valley Zone of Assam

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ABSTRACT

The study, carried out in the Upper Brahmaputra Valley Zone (UBVZ) of Assam, was designed to assess the extent of adoption of improved cultivation practices of Bhut jolokia, its relationship with farmers' socio-economic characteristics and problems faced by farmers during adoption. The adoption level of improved practices by the farmers was 51.00% in high level category, followed by 49.00% in medium level. Proportion of adopters were found to be the highest in the district of Dibrugarh (60.00%) closely followed by Golaghat (55.00%) and Sivasagar (50.00%). More than 80% farmers adopted the improved cultural practices like planting at recommend time (98%), proper drainage facilities (88%), pesticide application (87%) as suggested. More than 60% farmers adopted the application methods of fertilizer and applied at proper time. Socio-economic characteristics, viz., size of operational land holding ($r = 0.21$), annual family income ($r = 0.30$), training exposure ($r = 0.52$) and information source utilization ($r = 0.34$) had positive and significant association with the extent of adoption; while age having negative correlation with the extent of adoption. Intervention of middlemen in marketing of harvest, pest and disease problems and lack of market information are the major problems faced by the farmers of Bhut jolokia growers.

Key words: *Bhut jolokia; Adoption; Problems; Assam valley; Land holding; Improved practice;*

Bhut jolokia (*Capsicum chinense* Jacq.) is one important chilli extensively cultivated in North Eastern Region of India especially in the states of Assam, Nagaland, Manipur and Mizoram since ancient time. It is one of the hottest chilli in the world (Michaud *et al.* 2009; Mathur *et al.*, 2000; Lopez, 2007). The chilli is used as spice and condiments in sauces, pickles and for flavouring curries and adding hotness to the non-vegetarian foodstuff.

Bhut jolokia occupies an important place in the Assamese cuisine and has a long standing association with ethno-agricultural activities of people of Assam. Capsaicin, the active ingredient of chilli responsible for pungency, is used to relieve the pain of peripheral neuropathy (Backonja *et al.*, 2008), and can inhibit the growth of a variety of cancer cells (Mori *et al.*, 2006; Baek *et al.*, 2008). *Bhut jolokia* possesses anti-inflammatory and antioxidant activities (Surh, 2002;

Baek *et al.*, 2008). The people of this region grow this chilli traditionally for a long time and the present generation of farmers is keen to adopt the improved cultural practices, recommended by the Assam Agricultural University and the state Department of Agriculture/Horticulture, since the chilli has gained the status of one of the most economically viable dollar-earning crop of the state.

The commercial cultivation of the crop brings a new ray of hope for the economic and social upliftment of the farmers and the state as a whole. Both Government and private organization put efforts to cultivate the *Bhut jolokia* in commercial basis in this region. The State Department of Agriculture, Government of Assam, under the scheme Technology Mission for Development of Horticulture in North Eastern Region including Sikkim (Mini Mission-II) has taken up 500 hectares of land for cultivation of *Bhut*

jolokia. Farmers were provided incentives for the cultivation of crop of Rs. 18750.00 per hectare for purchasing of seed and equipment. With the advent of a proper scientific package of practice along with the use of modern technology, *Bhut jolokia* farming is expected to become popular among farmers and contribute more to the economy. So the present study was designed to assess the extent of adoption of improved cultivation practices of *Bhut jolokia*, its relationship with farmers' socio economic characteristics and to find out the problems faced by farmers in adoption of *Bhut jolokia* cultivation practices.

METHODOLOGY

The present study was conducted in all five districts of Upper Brahmaputra valley zone of Assam namely Tinsukia, Dibrugarh, Sivasagar, Jorhat and Golaghat district. A proportionate cum random sampling technique was followed for selection of respondents of the study. All total 100 *Bhut jolokia* growers were selected randomly as respondents of the study from ten villages considering two villages from each district. For selection of respondents, a comprehensive list of *Bhut jolokia* growers was prepared with the help of village headman and Agriculture Development Officers of the respective Blocks. Data were collected by personnel interview through suitable structured schedule. The frequencies of respondents on adoption of each practice were calculated. The frequency and percentage of adoption were calculated out for each of 20 selected improved practices of *Bhut jolokia* cultivation.

The extent of adoption score of each respondent regarding each of selected practice was calculated by giving 2 score for full adoption, 1 score for partial adoption and zero (0) for non adoption. The extent of adoption score of each respondent for all the cultivation practices of *Bhut jolokia* as a whole was calculated as follows:

$$E_a = \frac{\sum O_n}{\sum O_{pm}} \times 100$$

E_a = Extent of adoption for a respondents

$\sum O_n$ = sum of score obtained by a respondent for n cultivation practices

$\sum O_{pm}$ = sum of maximum possible score obtained by a respondent for n cultivation practices

On the basis of the computed extent of adoption score the respondents were classified into three categories viz. low, medium and high.

To find out the relationship between extent of adoption and socio-economic characteristics of respondents, Pearson product moment co-efficient of correlation was used. In order to test the significance of correlation between two variables 't- test' was done.

In order to study the problems faced by the farmers in adoption of improved cultivation practices of *Bhut jolokia*, the respondents were provided with structured questions to mention the degree of seriousness as very serious, serious, not very serious and not a problem with scores 3, 2, and 1 and 0 respectively. The total rank score for each problem was obtained by multiplying the frequency of problems in the response category with the respective weightage and adding them up. Then the mean score of each of the problems were found out along with their respective rank. All the 51 problems selected through discussion with members of farmers organization, Agriculture Development Officers and scientists of Krishi Vigyan Kendras were ranked according to their mean score. Out of 51 problems few problems which were ranged from very serious to serious, were ranked in ascending order (I-X) and the first ten problems could be considered as important problems as perceived by the respondents in relation to cultivation of *Bhut jolokia*.

RESULTS AND DISCUSSION

Extent of adoption of improved practices of Bhut jolokia cultivation: The Table 1 reveals that almost equal proportion of respondents was distributed in medium and high level of adoption category. The mean adoption scores (41.33) indicates high level of adoption of improved *Bhut jolokia* cultivation practices. This may be due to commercialization of the crop. Though this crop has been grown traditionally in the study area but now farmers started cultivation of the crop commercially due to its high market demand as well as high price.

Table 1. Distribution of respondents according to their overall extent of adoption of improved practices of *Bhut jolokia* cultivation (N=100)

Category	Score Range	N (%)	Mean	SD
Low	0-20	0.00	41.33	7.50
Medium	21-40	49.00		
High	41-60	51.00		

A perusal of the Table 1 clearly reveals that the overall adoption of improved cultivation practices of *Bhut jolokia* was high i.e. majority of the respondents

(51.00%) were in the high extent of adoption category followed by 49.00 per cent in the medium extent of adoption category. Similar findings were reported by Hanumanaikar, et al., (2009). It is observed from Fig-1 that in case of high adoption category the maximum percentage of respondents were found in Dibrugarh district (60%) followed by Golaghat districts (55%) while in case of medium adoption category it was in Jorhat and Tinsukia district with equal proportion (55%). No one found in low adoption category in all districts of UBZV of Assam which indicates that respondents adopted improved cultivation practices of *Bhut jolokia*. The mean score of extent of adoption indicated that on an average the respondents belonged to the 'High' category of extent of adoption. This indicates that farmers are adopting improved cultivation practices due to high market demand of *Bhut jolokia*.

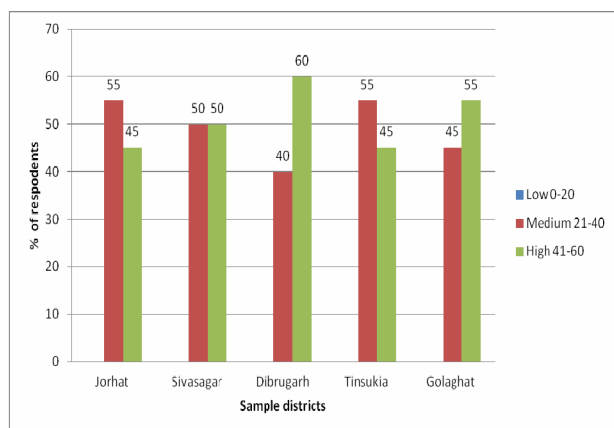


Fig. 1. Distribution of respondents according to adoption category in sample districts

Distribution of adopter of different improved cultivation practices of Bhut jolokia : The Table 2 reveals that seed and seedling treatment, recommended seed rate and spacing were not followed by majority farmers while recommended time of planting was followed by 98% farmers (Sharma, 2002). This indicates that majority of farmers did not prepare nursery for raising their seedlings and they purchased the seedlings from fellow farmers or nursery. The proportion of respondents who regularly uses manures and fertilizer was only 31 per cent. More than 60 per cent farmers followed time and method application of fertilizers but only 41 per cent farmers applied fertilizers with recommended doses. Reason may be due to wrong perception about fertilizers use, fertilizers' quality and not aware about soil testing. Farmers applied proper irrigation

schedules (35%) since the crop is cultivated in upland situation and proper drainage facilities (88%) is created to drain out extra water from root zone of the crop specifically during the maximum wettest month i.e. June, July and August. In order to control weed, a considerable proportion of farmers (57 per cent) adopted manual weeding method for control weed. It is possible only for small scale cultivation of this crop. A few proportion of farmers (6%) applied herbicides for control of weeds. The small tea grower generally cultivated *Bhut jolokia* initially for 2-3 years either as sole crop or inter crop with tea sapling. So, these farmers generally use herbicides to control weeds. Majority of *Bhut jolokia* growers (more than 60%) adopted the plant protection measure against pests and diseases. Similar findings were reported by Hanumanaikar et.al. (2009).

Table 2. Distribution of adopters of different improved cultivation practices of Bhutjolokia (N=100)

Practices	Adopter (%)
Treatment of seeds/seedlings against seed borne/soil born diseases	41.00
Seed rate for sowing in the nursery bed	35.00
Time of Planting	98.00
Spacing	47.00
Use of manures	31.00
Use of recommended dose of fertilizer	41.00
Application of fertilizers in recommended time	67.00
Fertilization through correct method	69.00
Irrigation	37.00
Proper drainage facilities adopted	88.00
Use of herbicides for weeding	6.00
Adopting manual weeding	57.00
Use of proper chemical for specific pest	63.00
Use recommended doses of pesticides	64.00
Frequency of application of pesticides	87.00
Time of application of pesticides	60.00
Use of proper chemical for specific disease	70.00
Use of chemical against the diseases	69.00
Frequency of application of chemicals	84.00
Time of application of chemicals	79.00

Correlation between selected socio-economic characteristics of farmers with the extent of adoption of improved cultivation practices of Bhut jolokia: The findings about correlation represented by Table 3 revealed that age had negative and significant association with the extent of adoption of improved cultivation practices in *Bhut jolokia*. It means that percentage of

adopters was observed better among those farmers who were of young age. A similar finding was reported by *Mariyono et.al* (2009). On the other hand, size of operational land holding ($r= 0.21$), annual family income ($r= 0.30$), training exposure ($r= 0.52$) and information source utilization ($r= 0.34$) had positive and significant association with the extent of adoption. It implies that with the increase in size of land holding under operation, there is increase in the rate of adopters of improved practices of *Bhut jolokia*. Again, with increase in income, there is an increase in the extent of adoption. Farmers with lower income have low investment capacity and low risk bearing ability. They cannot afford to spend money required for purchasing seedlings, plant protection chemicals, nutrients and growth regulators etc which are higher as compared to other field crops. A positive and significant association with “training exposure” implies that farmers who have attended more numbers of training have gained more knowledge and skill in *Bhut jolokia* farming and are more interested for adoption of the improved cultivation practices of the crop. Positive and significant correlation with “information source utilization” indicates that with increase in the sources of information utilized by the farmers, there is increase in the extent of adoption of improved cultivation practices of *Bhut jolokia*.

It was found that education, size of the family and institutional linkage had no profound or significant association with the extent of adoption of improved cultivation practices in *Bhut jolokia*.

Table 3. Relationship between selected characteristics of farmers with the extent of adoption of improved cultivation practices of *Bhut jolokia*

Variable	'r' value	't' value
Age	-0.23	2.40*
Education	0.16	1.63
Size of the family	-0.07	0.73
Size of operational land holding	0.21	2.22*
Annual family income	0.30	3.23**
Training exposure	0.52	6.21**
Institutional linkage	-0.10	1.02
Information source utilization	0.34	3.69**

*Correlation is significant at 0.05 level of probability

** Correlation is significant at 0.01 level of probability

Problems faced by the farmers in adoption of improved cultivation practices of Bhut jolokia: As

shown by rank found through frequency, percentage and finally mean score the top ten most serious problems were listed out from fifty-one such problems faced by the farmers in adoption of improved practices in cultivation of *Bhut jolokia* which is presented by table 4. Intervention of middlemen (WMS -2.27) was found to be the most serious problem. Other problems according to their rank are Pest attack (WMS-2.02), Lack of market information/intelligence (WMS-1.97), Fungal infestation (WMS-1.87), Non-availability of seeds/seedlings (WMS-1.74), Lack of credit facilities in time, Lack of adequate knowledge about plant protection equipments, Lack of adequate knowledge of plant protection chemical, fertilizer, dose, method and time of application, Lack of govt. irrigation facilities and Lack of technical guidance for using plant protection chemicals.

Table 4. Problems faced by the farmers in adoption of improved practices in cultivation of *Bhut jolokia*

Problems	WMS	Rank
Intervention of middlemen	2.27	I
Pest attack	2.02	II
Lack of market information/intelligence	1.97	III
Fungal infestation	1.87	IV
Non-availability of seeds/seedlings	1.74	V
Lack of credit facilities in time	1.73	VI
Lack of adequate knowledge about plant protection equipments	1.65	VII
Lack of adequate knowledge of plant protection chemical, fertilizer, dose, method and time of application	1.61	VIII
Lack of govt. irrigation facilities	1.36	IX
Lack of technical guidance for using plant protection chemicals	1.28	X

(WMS= Weightage Mean Score)

CONCLUSION

Bhut Jolokia growers are distributed in medium and high categories of adoption level but they did not adopted all improved cultivation practices specifically seed rate, seed treatment and fertilizers application. Farmers are still following traditional method of cultivation of *Bhut jolokia*. But young farmers adopted the improved *Bhut jolokia* cultivation practices as compared to old age persons. So, the concerned department should put sincere effort to attract more youth in *Bhut jolokia* cultivation. Further, those farmers who

are rich with sufficient cultivable area and have good mass media exposure are interested to adopt improved cultivation practices. But still location specific research is necessary for augmenting cultivation of crop. Capacity building programme for these farmers has to be arranged for adoption of cultivation practices. Infestation of diseases is the major problem for this crop. So specific research for controlling the diseases is very important effort required

to put forward by the research organization specifically State Agricultural University. Convergence of different stakeholder at grass root level is more important for augment this dollar earning crop. The extension agency should give more emphasis in group approach for rendering their services to the farmers.

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