

## Knowledge of Students and Technical Staff about Agricultural Biotechnology in Jharkhand

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### ABSTRACT

*Agricultural biotechnology deals with genetically modified (GM) crops as well as tissue culture, micropropagation, marker assisted selection, biopesticides, etc. GM crops have potential to meet food requirement of rising population and cope adverse impact of climate change. People are having different opinion about adoption of GM crops. Few people are of the opinion that GM crops may adversely affect human beings as well as animals. But some people are in favour of adoption of GM crops for enhancing productivity and human welfare. Knowledge about agricultural biotechnology especially GM crops is important for providing feedback regarding adoption or rejection of the technology. The present study was taken up to assess the agricultural biotechnology knowledge of students from agriculture and allied disciplines and technical staff of ICAR and State Agriculture University in Jharkhand. Data was collected from 50 students and 50 technicals in Jharkhand. Analysis of data revealed that both students and technicals had less knowledge about GM crops in comparison to non-GM aspects (bio-pesticide, tissue culture, DNA finger printing, marker assisted selection, etc) of biotechnology. Most of the students (76 %) and technicals (60 %) had medium level of knowledge of agricultural biotechnology. Sex of the student respondents had significant correlation (at 0.01 level) with their knowledge level. The outcome of study will be helpful in policy formulation about generating awareness and adoption of agricultural Biotechnology.*

**Key words:** Agricultural biotechnology; GM crops; Knowledge level; Students; Technicals;

The impact of climate change on agriculture could result in problems with food security and may threaten the livelihood activities. In this perspective, to meet food requirement of rising human population is a great challenge. Traditional crop breeding is not able to meet this challenge. Agricultural biotechnology with its novel approaches e.g. transgenic breeding may be helpful in meeting food as well as feed requirement. Agricultural biotechnology allows plant breeders to make precise genetic changes to impart beneficial traits to the crop plants through genetic engineering. Golden rice, golden mustard, pharma foods, food with extended shelf life, new variety of corn, sorghum, wheat and plants that resist viral pests, saline soils, etc. are being developed through biotechnology. Genetically modified (GM) crops are also being developed for resistance against insect

pests, pathogens, abiotic stresses (e.g. high temperature, water stress, etc.), nutrient deficiency, herbicide tolerance, etc. There is apprehension from few people that GM crops may adversely affect human beings as well as animals. But few people are in favour of adoption of GM crops for human welfare. Knowledge about agricultural biotechnology especially GM crops is very important for acceptance or rejection of the technology. There is need to study knowledge of different stakeholders about agricultural biotechnology so that government may plan and act for awareness programme, technology adoption, etc. (Yadav *et al*, 2019). Students are eager to know various technologies of agricultural biotechnology and technical staff may apply these technologies in the field. Hence, the present study was taken up to assess the knowledge level of

students and technicals about agricultural biotechnology in Jharkhand.

**METHODOLOGY**

The study was carried out during 2017. Knowledge in this study was operationalized as the understood information about agricultural biotechnology possessed by students and technicals of Jharkhand. For this purpose a knowledge test was developed. A test is a set of questions, each of which has a correct answer, to which the people respond (Roy and Mondal, 2004). Knowledge test (Yadav et al, 2018) used for assessing knowledge level of students and technical staffs in

Jharkhand are mentioned in Table 1. The respondents put “ mark in correct/ wrong/ not known responses against each statement. For correct answer 1 score and for wrong/ not known answers 0 score were awarded. Scoring was reversed in case of negative statements. Schedule was developed using this knowledge test and pretested before data collection. Fifty students from different disciplines of agriculture and allied subjects and fifty technical staffs working in ICAR institutes and State Agriculture University in Jharkhand were randomly selected for data collection. The knowledge score of each respondent in student and technical categories was calculated by summing the scores obtained by him/ her

**Table 1. Knowledge test about agricultural biotechnology**

Selected knowledge statements (Items)	Correct	Wrong	Not known
Gene is found on chromosomes in a cell of an organism.			
Bt cotton, Bt brinjal, Bt tomato, Bt soyabean, Bt maize, Bt canola, Bt paddy, etc. are examples of GM / Transgenic crops.			
Agricultural Biotechnology does not only deal with transgenic crops but also with tissue culture, micropropagation, marker assisted selection, etc			
Genetically Modified (GM) crops are being developed not only for resistance against insect pests but also to cope with pathogens, abiotic stresses, nutrient deficiency and herbicide tolerance			
Bt Cotton only reduces losses caused by attack of Ballworm.			
Barnase Barstar gene derived from bacteria plays important role in hybrid seed production in mustard crop			
Whole genome sequencing of many crop plants such as rice, tomato, pigeon pea, etc. are available			
Transgenic cauliflower, cabbage, potato, brinjal, tomato, rice, mustard and bhindi have not been developed in India			
Biopesticide ( e.g, Trichogramma, , Trichoderma, NPV, etc.) are effective in managing insect pest and disease in various crops			
Improved variety of Banana (G- 9) was developed through tissue culture technique			
Synthetic seed is also developed through tissue culture technique			
Paddy variety ‘Improved Pusa Basmati 1’ has been developed using Marker Assisted Selection (MAS)			
Golden rice has not enhanced content of beta Carotene (precursor of Vitamin A)			
DNA finger printing is used for analysis of diversity at genome level			
Phytoremediation is used for removal of toxic elements from soil through planting of suitable plants followed by uprooting and transplanting at other places			
Bt Brinjal is not released for cultivation in Bangladesh			
China has approved commercial Bt Rice trials			
Double Bt genes are used in Biotech Crops to avoid increase in population of resistant insects			
Release of GM crop is not regulated process			
Sugarcane seedling was developed through tissue culture technique			

on all the items. Score of respondent may vary from 0 to 20. The higher score indicated that respondents have more knowledge about agricultural biotechnology.

## RESULTS AND DISCUSSION

Fig. 1 depicted that students had more knowledge about agricultural biotechnology than technicals. Students scored maximum marks in items 1 and 2 (Table 1). Items 1 and 2 may be considered as basics of Biotechnology. Most of the student respondents are graduate and post graduate in science and they know basics of Biotechnology. However, students scored least in item 18 which states that Double Bt gene are used in Biotech crops to avoid increase in population of resistant insects. This item is relatively advance in Biotechnology which may not be known to most of the students. Technical staffs scored maximum marks in items 4 and 9. Item 4 tells about basics of genetically modified (GM) crops. Item 9 is related to bio- pesticide. These topics are generally discussed at various platforms and biopesticides are used in organic cultivation. Most of the technical staffs might have used biopesticide in the field. Technicals scored least score in items 7 and 18. Item 7 is related to genome sequencing

which is also relatively advance in Biotechnology.

Fig.2 depicted that both students and technicals had more knowledge about non-GM aspects (bio-pesticide, tissue culture, DNA finger printing, marker assisted selection, etc) of agricultural biotechnology in comparison to GM crops. This finding is similar to the findings obtained in knowledge level of scientists and farmers about agricultural biotechnology (Yadav *et al*, 2019). Technical staff were less aware about Bt brinjal, Bt tomato, Bt soyabean, Bt maize, Bt canola, transgenic cauliflower, cabbage, potato, etc.

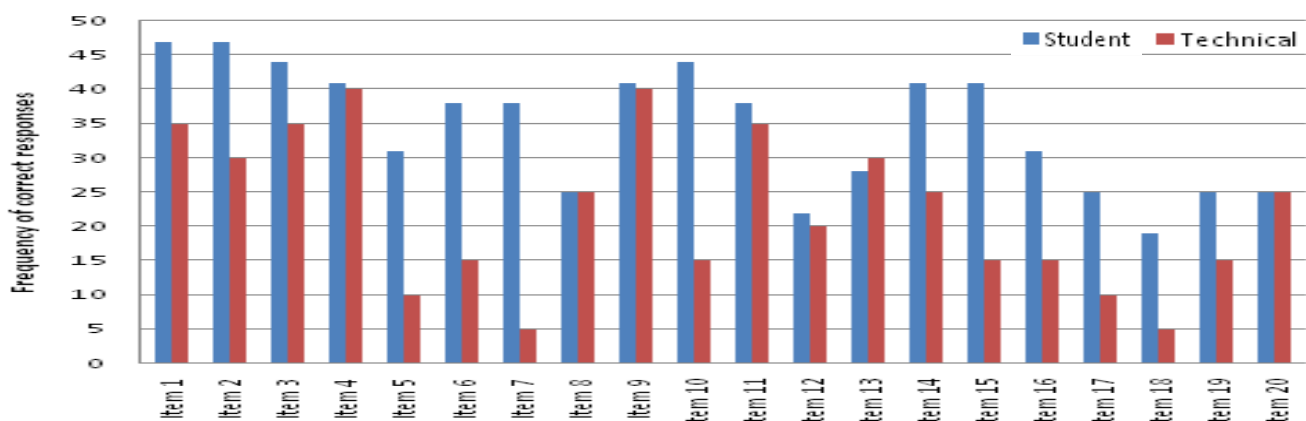
Table 2 showed that difference between mean knowledge score of students and technical staff about agricultural biotechnology was significant at 0.05 level of probability and students' knowledge score was higher than that of technicals. Most of the students (76 %) and technical staff (60 %) had medium level of knowledge about agricultural biotechnology.

In order to determine the relationship between profile of student respondents and their knowledge level, correlation coefficient was computed. It was observed that sex of the student respondents had significant positive correlation (at 0.01 level) with their knowledge level (Table 3). It reflects that girl students had better

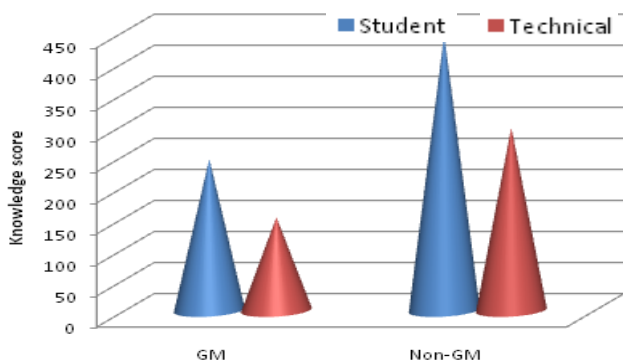
**Table 2. Knowledge level of students and technicals about agricultural biotechnology**

Mean knowledge score	Students (N=50)		Mean knowledge score	Technicals (N=50)		“t” value
	Knowledge Level	No. (%)		Knowledge Level	No. (%)	
13.75	Low	09(18)	8.90	Low	15(30)	4.96*
	Medium	38(76)		Medium	30(60)	
	High	03(06)		High	05(10)	

\* Significant at 0.05 level of probability



**Fig.1. Item wise knowledge of students and technicals about agricultural biotechnology**



**Fig.2. Knowledge of students and technicals about GM crops and Non-GM aspects in agricultural biotechnology**

**Table 4. Relationship between profiles of technical staff with their knowledge about Agricultural Biotechnology**

Independant variable	r value
Age	-.274
Sex	.305
Education	.466
Family Background	-.044
Service length	-.232
Membership of society	-.195
Social participation	-.383

knowledge of agricultural biotechnology than their counterparts. Preference of girl candidates towards agricultural biotechnology may be due to laboratory oriented job. Age, education, family background, field experience, membership of society and social participation of students had non-significant correlation with their knowledge level.

Table 4 indicated that age, sex, education, family background, service length, membership of society and social participation of technical staffs had non-significant

**Table 3. Relationship between profiles of students with their knowledge about Agricultural Biotechnology**

Independant variables	r value
Age	.120
Sex	.652**
Education	.230
Family background	.203
Field experience	.042
Membership of society	.341
Social participation	-.023

correlation with their knowledge level regarding agricultural biotechnology.

### CONCLUSION

Knowledge test consists of twenty statements of agricultural biotechnology, out of which eight statements were regarding GM crops and twelve statements represented non-GM aspects of agricultural biotechnology. Knowledge score obtained from above mentioned test reflected awareness of students and technical staffs about GM crops, biopesticide, DNA finger printing, tissue culture, marker assisted selection and other aspects of agricultural biotechnology. Most of the students (76 %) and technical staffs (60 %) had medium level of knowledge of agricultural biotechnology. Both students and technicals had less knowledge about GM crops in comparison to non-GM aspects (bio-pesticide, tissue culture, DNA finger printing, marker assisted selection, etc) of agricultural biotechnology. This result will be useful for policy makers in making plan for generating awareness about GM crops among farmers.

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