

Knowledge and Awareness among Students and Teachers on Genetically Modified Crops in Academic Institutions of Mandya District

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ABSTRACT

Genetically modified crops provide stronger resistance to diseases, pests, insects and herbicides along with higher tolerance to drought and salinity. GM crops are the improved crop plants with one or two genes from unrelated organisms that are introduced for insect resistance, herbicide tolerance, virus resistance, delayed ripening etc. The GM crops are doing extremely well in the introduced regions but there is no equivalent acceptance among consumers and have stirred up controversy across the globe. A study was undertaken to assess the knowledge level and perception of teachers and students towards genetically modified crops. The survey was carried out in science, engineering and agriculture colleges in Mandya district of Karnataka with closed questionnaire method using three-point Likert scale. Sample size constituted 38 teachers, 173 agriculture students and 159 non-agriculture students. The questionnaire constituted 5 parts viz., Knowledge, Safety, Acceptance, Need for GM crops and Need for Awareness. Only 12.71% of respondents had complete knowledge on GM crops and 79.95% felt that awareness programmes are essential. About 3.36% expressed that GM crops are not safe, while around 82% of respondents expressed their acceptance for GM crops and they think that GM crops are needed for sustainable agriculture and economic improvement of farmers. Though we cannot correlate the awareness level with acceptance, complete understanding about merits and demerits of GM crops, it is indispensable for tactful selection of the product of preference. Disregarding the technology out of ignorance and lack of knowledge would finally deceive the farmers. Therefore, awareness programmes and campaigns are pivotal for effective dissemination and utilization of technology.

Keywords : GM crops, Acceptance, Knowledge, Awareness, Students

GENETICALLY modified crops provide stronger resistance to diseases, pest, insects and herbicides along with higher tolerance to drought and salinity. GM crops are the crop plants into which one or two genes from unrelated organisms like animals, bacteria viruses, insects etc, have been introduced using recombinant DNA techniques. Major traits that are introduced are insect resistance (Cotton), herbicide tolerance (Maize), virus resistance (Papaya), delayed ripening (Tomato), nutritional enhancement (Rice), altered oil composition (Canola) and male sterility-restorer system (Brassica) (Biotech crop annual

update, ISAAA, 2015). The GM crops can contribute to ensuring food security for the increasing population in the higher risks of climatic change. Further, they are doing extremely well in the introduced regions, but there is no equivalent acceptance among consumers globally.

GM crops have stirred up controversy across the globe and in India politically, socially and also among intellectuals of diverse background. The technology that has come out has a boon to farmers with many agricultural applications has attracted protagonists and

antagonists from all forum like arts and humanities, law, engineering, political sciences and economics and also general public (Stewart and McLean, 2005). The major cause of the debate being lack of understanding of the biotechnology processes and principles; which has blinded the general public and has made them skeptical about the technology. In addition, failure of media to convey the importance and benefits and extensive criticism of environmentalist has put the GM crops into stake (Pardo *et al.*, 2002).

European Union has restrictions on GM crops cultivation and import and attitude of Europeans towards GMOs is negative according to Eurobarometer data (Pardo *et al.* 2002). India, having >95% of cotton area under Bt cotton has laid moratorium on transgenic food crops. Though USA is open for all kinds of GMOs, it has made labeling mandatory to appease adversaries (Harrison *et al.*, 2004).

Biotechnology, new arena encroaching our everyday lives at all level, is often less understood, misinterpreted and exaggerated in terms of its deliverables to mankind. Print and digital media determine the perception of GM crops often also called as “biotech crops” by general public. Most often, the information given by media will be overstated and manipulated in an attempt to making it sensational. In India, farmers who are the major beneficiaries of GM crops, have only little or no education. Due to lack of platforms to disseminate the required information about these technologies to common man, the farmers primarily depend on media or their children who are educated.

Teachers form the link between science and society. Student’s knowledge and opinion of any technology is largely influenced by teacher’s knowledge and their perception towards the technology. As students, during their course of interaction, may also tend to get influenced by personal views of the teachers. Therefore, teacher’s perception of technology may also decide student’s mindset towards the technology. Beyond this teacher have to have updated information of any technology for effective delivery of subject.

Biotechnology, being the advanced subject with new concepts and techniques is often not updated by teaching fraternity. Therefore, the present study was designed to assess the knowledge level and perception of teachers and students towards genetically modified crops. Comprehensive understanding of science behind the GM crops plays a major role in critical evaluation of GM products and in taking factual decisions. Consumer’s orientation is the deciding factor of the GM products in pipeline, which also influence the investment in biotechnology research and development.

MATERIALS AND METHODS

The survey was carried out in science, engineering and agriculture colleges in Mandya district of Karnataka state in India. Agriculture students have collected the data as a part of course work. To find out the knowledge, understanding and acceptance of teachers and students towards GM crops, a questionnaire comprising 14 closed ended questions with Likert scale was prepared. Likert scale is a scale that offers agree and disagree as to the polar points along with a neutral option (0-No, 1- Neutral, Yes – 2). The questionnaire was divided into 5 parts that comprised, 1) Knowledge 2) Safety 3) Acceptance 4) Need for GM crops 5) Need for Awareness. The questionnaire was given to teachers and students and were asked to answer. Later, the data was collected from the questionnaire for analysis.

Teachers and students from science, engineering and agriculture colleges in Mandya district are the samples for the study (Fig-1). The teachers were from various disciplines like mechanical, civil engineering, political science, psychology, history, microbiology, genetics, statistics, nutrition, agronomy, pathology etc. Similarly, students were divided into two groups. One group consisted of students studying agriculture and related subjects with exposure to biotechnology related concepts (93 students) and also agriculture students without exposure to biotechnology related concepts, as they are yet to register those courses (80 students). Second group from diverse disciplines like arts, science and engineering. Details of the samples



Fig. 1 : Map of Mandya district showing the study area

are depicted in Table-1. The questionnaire was distributed among 38 teachers, 173 agriculture students and 159 non-agriculture students. The data was collected from teachers and students of different colleges in Mandya.

Data Analysis: The data were statistically analyzed by applying the SND-test (Z-test) to obtain the

distribution pattern of the students and teachers about Knowledge, Safety, Acceptance, Need for GM crops and Need for Awareness.

RESULTS AND DISCUSSION

Knowledge among agriculture major students was slightly more than teachers; which may be mainly due to diverse background of teachers. About 79.89% of teachers felt the GM crops are necessary to tackle growing population and food demand; 83.15% supported the cultivation of GM crops but they were less clear about the safety aspects. Few refrained from taking this question while some preferred to stay neutral. 75.17% felt there is need for awareness programme to communicate the technology to farmers and general public.

Only 39.32% of students with no agriculture background had slight awareness about GM crops though 79.39% of them accepted the cultivation of GM crops and 78.5% felt GM crops are needed for

TABLE 1

Respondents selected for the study

Respondents	Numbers
Teachers	38
Students from College of Agriculture	
Agriculture Students (without exposure to GM crops)	80
Agriculture Students (with exposure to GM crops)	93
Non- agriculture Students	159
Total respondents	370

TABLE 2
Knowledge, need for awareness, need for GM crops, safety and acceptance among Teachers and students of agriculture and non-agriculture streams.

Attributes	Teachers	Non-agri. students	Agri. students	Total
	Z- dist (N = 34)	Z -Dist (N = 173)	Z -Dist (N= 159)	Z -Dist (N = 367)
<i>Knowledge</i>				
Are GM crops sustainable in their nature?	51.60	48.01	43.64	46.41
Is GM technology against the conventional agriculture?	6.43	16.11	16.60	85.77
Do you think co-existence of organic farming and transgenic would-be better option?	70.54	66.64	70.19	69.5
Do you think that participation of public sector in GM crops is essential?	60.26	57.14	75.80	67.72
Do you know the status of GM crops in India?	28.77	8.69	14.92	12.71
<i>Need for Awareness</i>				
Is GM awareness essential in India?	75.17	80.23	79.39	79.95
<i>Need for GM Crops</i>				
Will GM crops improve the economic status of the farmer?	77.94	85.99	70.88	79.39
Will GM crops play an important role in second green revolution in agriculture?	80.51	75.49	61.03	70.88
Will GM technology meet the needs of food grain production for growing population?	75.80	77.64	77.64	78.23
Are GM crops boon to agriculture?	85.31	74.86	75.17	77.04
<i>Safety</i>				
Are GM crops eco-friendly?	16.60	61.41	68.79	59.1
Is Bt poison to human?	7.64	4.18	2.44	3.36
<i>Acceptance</i>				
Do you support GM crops?	83.15	79.39	83.65	82.8
Do you have any reason to refuse GM technology?	7.08	4.36	4.55	4.27

welfare of farmers and nation. About 80.23% of them expressed need for awareness programmes emphasizing the essentiality of such campaigns at school and colleges also.

About, 83.7% of agriculture major students support cultivation of GM crops and 71.2% expressed transgenic crops are need of the hour for enhancing financial status of the farmers and for sustainable agriculture. Knowledge level among agriculture major students did not significantly differ from non-agriculture students as only half of the students were exposed to scientific information of GM crops.

Therefore, 79.4% of agriculture students also expressed public awareness of GM crops is essential

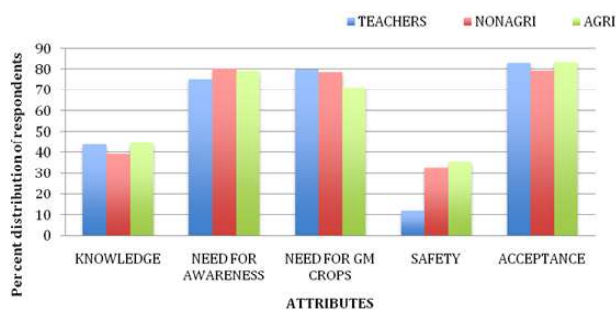


Fig. 2: Knowledge, need for awareness, need for GM crops, safety and acceptance among teachers, agriculture & non-agriculture students

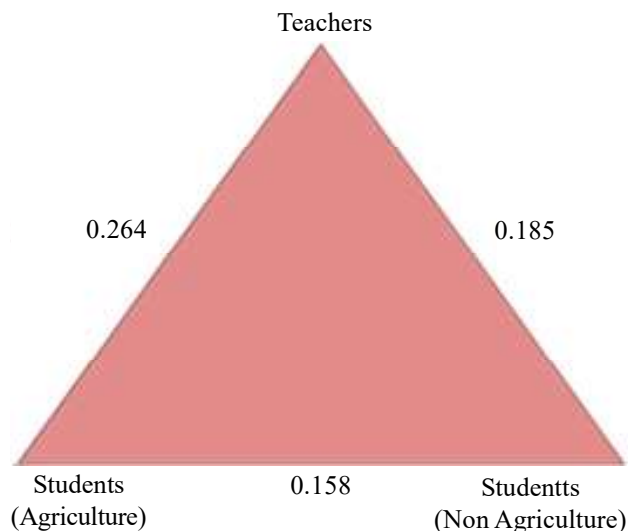


Fig. 3 : Correlation coefficient between teachers and students of agriculture and non-agriculture streams

About knowledge on GM crops

Spearman Rank Correlation Coefficient between Teachers & Non-Agri. Students	+0.70
Teachers & Agri. Students	+0.90
Non-Agri. & Agri. Students	+0.90

to remove misconceptions sown by media and to educate farmers and public about the benefits of the technology. Results are in line with Chandre Gowda *et al.* (2020).

Ranks were assigned among teachers, Non-Agriculture and Agriculture students based on the attributes. Calculated spearman correlation coefficients between all possible combinations of teachers, Non-agriculture and Agriculture Students.

Ranks based on Attributes

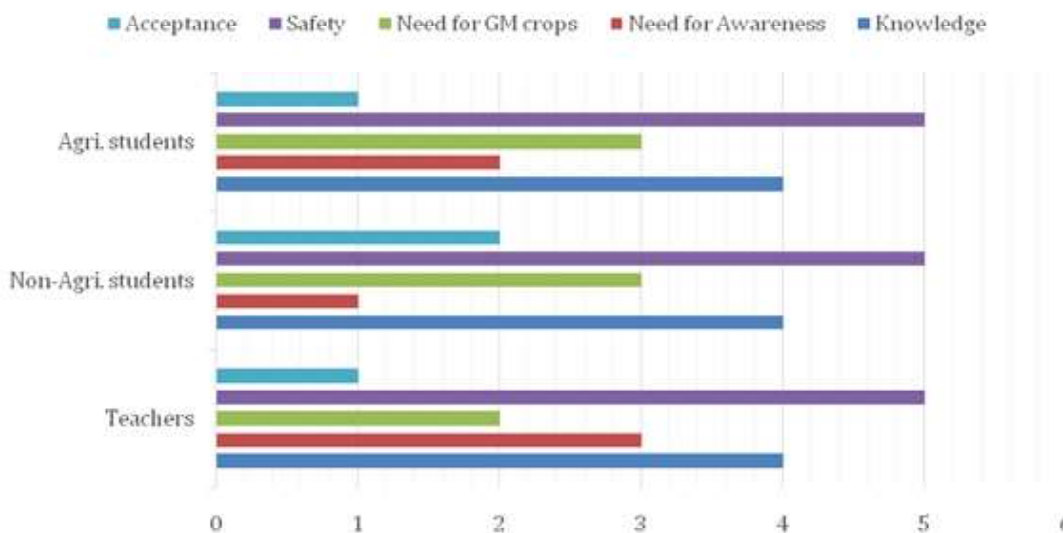


Fig. 4 : Ranks obtained by the Teachers, Non-Agriculture and Agriculture students based Attributes

TABLE 3

Ranks obtained by the Teachers, Non-agriculture and agriculture students based attributes

Attributes	Teachers	Rank	Non-Agri.	Rank	Agri.	Rank
Knowledge	43.52	4	39.318	4	44.23	4
Need for awareness	75.17	3	80.230	1	79.39	2
Need for GM crops	79.89	2	78.495	3	71.18	3
Safety	12.12	5	32.795	5	35.62	5
Acceptance	83.15	1	79.390	2	83.65	1

The highest significant positive correlation was observed between Teachers and Agriculture students and on par with Non-Agriculture and Agriculture students. It shows that the combination with agriculture students with any category of the people can get the more acceptance, complete understanding about merits and demerits of GM crops. Similar findings were recorded by Gaikwad *et al.* (2013).

Complete understanding about merits and demerits of GM crops is pivotal in its application. Students play an important role in the society for dissemination of such technologies to the grassroot level. If the awareness of new technologies is denied, it is indispensable for tactful selection of the products of preference. Disregarding the technology out of ignorance would finally deceive the farmers from obtaining the benefits of the technology in particular and affects the national food production in general. Therefore, awareness programmes and campaigns are crucial for effective dissemination and utilization of GM technology. Further, inclusion of such agricultural concepts in non-agricultural courses provides better insight among the budding students.

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