Research Article

ASSOCIATION BETWEEN PERSONAL ATTRIBUTES OF FARMERS AND ADOPTION OF BT COTTON PRODUCTION TECHNOLOGY IN BHILWARA DISTRICT OF RAJASTHAN

BISHNOI MANMEET, SISODIA S.S., KUMAR VIKAS* AND KUMAR VINOD

Department of Extension Education, Rajasthan College of Agriculture, Maharana Pratap University of Agriculture and Technology, Udaipur, Rajasthan 313001, India
*Corresponding Author: Email-veer5agri@gmail.com

Abstract- Cotton is important fiber crop of India. The present study was conducted in the purposely selected Bhilwara district of Rajasthan. There are total twelve tehsils in Bhilwara district of Rajasthan, out of which, two tehsils namely Mandalgarh and Asind have been selected on the basis of maximum area under cultivation of Bt cotton. Four villages selected from each tehsil were taken on the basis of maximum area under Bt cotton cultivation. The list so prepared, 5 marginal, 5 small and 5 large Bt growers were selected randomly from each identified village. Thus, in all 120 farmers (40 marginal, 40 small and 40 large farmers) were included in the sample of the study. The show that personal characteristics of the Bt cotton growers *viz*., age, occupation, annual income, size of family, type of family, cosmopolitan outlook, economic motivation, and extension contact were not significantly associated with the adoption level of the respondents about Bt cotton production technology, whereas education played a significant role in adoption of improved Bt cotton cultivation practices.

Keywords- Bt-Cotton, Association, Production and Technology.

Academic Editor / Reviewer: Dr R.K. Mathukia

Introduction

Cotton (*Gossypium spp.*) the "white Gold", is a very important commercial crop of India. It sustains the country's cotton textile industry which is perhaps the largest organized industry in the country. Cotton is grown chiefly for its fiber use in the manufacture of clothes and for the purpose like making threads for mixing in other fiber and extraction of oils from the cotton seeds. The oil content in the cotton seed ranges from 15-25 per cent depending on the variety. American cotton contains more per cent of oil. Cotton seed cake after extraction of oil is good organic manure and contains about 6 per cent nitrogen, 3 per cent phosphorus and 2 per cent potash. Cotton linters, seeds and pulp obtained during oil extraction and cotton meal are good concentrate feed for cattle [1].

In India, the annual area under this crop is 76.6 lakh hectares with annual production of 136.0 lakh bales and average productivity of 301.5 kg per hectare. It is cultivated on a large scale in Maharashtra, Gujarat, Karnataka, Madhya Pradesh, Punjab, Rajasthan, Haryana, Tamil Nadu and Uttar Pradesh. Maharashtra is the largest producer of cotton in India followed by Gujarat and Andhra Pradesh. In India, the total area under Bt cotton cultivation was 7.0 Lakh hectares in the year 2008, which is 80 per cent of the total cotton growing area. In Rajasthan Bt cotton grown in an area of 4.5-5.0 lakh hectares which is 68 per cent of the total cotton growing area. The major cotton growing districts are Bhilwara, Chittorgarh, Rajsamand, Banswara, Shri-Ganganagar, Bikaner and Nagaur [2].

Materials and Methods

The present study was conducted in the purposely selected Bhilwara district of Rajasthan. There are total twelve tehsils in Bhilwara district of Rajasthan, out of which, two tehsils namely Mandalgarh and Asind have been selected on the basis of maximum area under cultivation of Bt cotton. Further, a comprehensive list of all the major Bt cotton growing villages was prepared in consultation with the personnel of revenue and agriculture department from the identified tehsil. Four villages selected from each tehsil were taken on the basis of maximum area under Bt cotton cultivation. Thus, total eight villages were selected for the present investigation. For selection of respondents, a comprehensive list of Bt cotton growers was prepared with the help of village patwari and agriculture supervisor of respective villages. The list so prepared, 5 marginal, 5 small and 5 large Bt growers were selected randomly from each identified village. Thus, in all 120 farmers (40 marginal, 40 small and 40 large farmers) were included in the sample of the study. [3,4]

Statistical Measures Used

In order to answer the research questions mentioned under hypothesis and to achieve the objectives of the study, investigator undertook appropriate and most pertinent statistical analysis. The following statistical methods were used in the present study

Percentage and frequency:

The percentage and frequency of each studied item was calculated and a comparison was made in interpreting the results.

Mean score:

It was obtained by dividing total score of each statement by total number of respondents.

$$\text{Mean score} = \frac{\text{Total score of each statement}}{\text{Total number of respondents}}$$

Mean per cent score:

It was calculated by multiplying total obtained score of the respondent by 100 and divided by the maximum obtainable score.

$$\text{Mean per cent score} = \frac{\text{Total score obtained}}{\text{Maximum obtainable score}} \times 100$$

Standard deviation:

The standard deviation was used for categorization of respondents in three groups on the basis of observed age, education, income, knowledge, adoption and constraints of farmers about Bt cotton cultivation practices. The formula for standard deviation is as follows:

$$S.D. = \sqrt{\frac{\Sigma X_i^2}{n} - \frac{(\Sigma X_i)^2}{(n)^2}}$$

Where,

S.D. = Standard deviation

ΣX_i^2 = Sum of square of the observations

ΣX_i = Sum of value of the observations

n = Number of respondents

Chi-square test:

It was used to study whether the two variables were independent or associated with each other:

For r X k contingency table:

$$\chi^2 = \sum_{i=1}^{r} \sum_{j=1}^{k} \left[\frac{(O_{ij} - E_{ij})^2}{\Sigma_{ij}} \right]$$

Where,

r = the number of row

k = the number of column

i & j = 1 to n

O_{ij} = observed frequency of each cell

E_{ij} = expected frequency of cell

X^2 = Chi-square value at (r – 1) (k – 1) d.f.

$$E_{ij} = \frac{R_i C_j}{N}$$

R_i = Row total of the ith row

C_j = Column total of the jth column

N = Total number of respondents

The level of significance at 5 per cent & 1 per cent were used

Results and Discussion

association between the adoption of Bt cotton production technology and selected personal variables *viz.,* age, education, occupation, income level, family size, family type, cosmopolitan outlook, economic motivation, and extension contact of cotton growers. To find out the association between these personal characteristics and adoption of Bt cotton production technology, chi-square test was applied. The results regarding association have been presented in subsequent tables

Association between age and adoption of Bt cotton production technology

Hypotheses:

Ho$_1$: There is no association between age and adoption of Bt cotton production technology.

RH$_1$: There is an association between age and adoption of Bt cotton production technology.

An analysis of [Table-1] shows that out of total 17 respondents in age group below

30 years, 5, 6 and 6 respondents were having low, medium and high level of adoption of Bt cotton production technology. In the age of 30 to 50 years age group, 14.29, 48.05 and 37.66 per cent farmers had low, medium and high level of adoption of Bt cotton production technology, respectively. While, in the age group of above 50 years, 7, 9 and 10 respondents possessed low, medium and high level of adoption of Bt cotton production technology, respectively.

Table-1 *Association between age and adoption of Bt cotton production technology*

n=120

Age category	Adoption of Bt Cotton production technology			Total	X^2
	Low	Medium	High		
<30 years	5(29.41)$^\Delta$ (21.74)$^{\Delta\Delta}$	6(35.29) (11.54)	6(35.29) (13.33)	17(100) (14.17)	
30 to 50 years	11(14.29) (47.83)	37(48.05) (71.15)	29(37.66) (64.44)	77(100) (64.17)	7.199 ^{NS}
> 50 years	7(26.92) (30.43)	9(34.62) (17.32)	10(38.46) (22.22)	26(100) (21.67)	
Total	**23 (19.17) (100)**	**52 (43.33) (100)**	**45 (37.50) (100)**	**120 (100)**	

NS= Non significant

Δ = Percentage of row

$\Delta\Delta$ = Percentage of column

Further analysis of [Table-1] clearly shows that calculated chi-square value (7.199) was less than tabulated value. Therefore, the null hypothesis (NHo$_4$) was accepted. This reveals that there is no association between farmer's age and adoption of Bt cotton production technology. It means that age does not play any significant role in adoption of Bt cotton production technology.

Association between education and adoption of Bt cotton production technology

Hypotheses:

Ho$_2$: There is no association between education and adoption of Bt cotton production technology.

RH$_2$: There is an association between education and adoption of Bt cotton production technology.

[Table-2] indicates that out of total 32 cotton growers in illiterate group, 5, 8 and 19 respondents possessed low, medium and high level of adoption of Bt cotton production technology, respectively. In the group of upto primary level of education, 15.56, 60.00 and 24.44 per cent respondents had low, medium and high level of adoption of Bt cotton production technology, respectively. While, in the group of upto secondary level of education, 6, 9 and 9 respondents reported in low, medium and high level of adoption of Bt cotton production technology, respectively. In the group of graduate 26.32, 42.11 and 31.58 per cent respondents reported in low, medium and high level of adoption of Bt cotton production technology, respectively.

Table-2 *Association between education and adoption of Bt cotton production technology*

n = 120

Education level	Adoption of Bt cotton production technology			Total	X^2
	Low	Medium	High		
Illiterate	5(15.63)$^\Delta$ (21.74)$^{\Delta\Delta}$	8(25.00) (15.38)	19(59.38) (42.22)	32 (100) (26.67)	
Upto primary class	7 (15.56) (30.43)	27 (60.00) (51.92)	11 (24.44) (24.44)	45 (100) (37.50)	14.579**
Up to secondary	6 (25.00) (26.09)	9 (37.50) (17.31)	9 (37.50) (20.00)	24 (100) (20.00)	
Graduate	5(26.32) (21.74)	8 (42.11) (18.46)	6 (31.58) (16.00)	19 (100) (15.83)	
Total	**23(19.17) (100)**	**52 (43.33) (100)**	**45 (37.50) (100)**	**120 (100)**	

** Significant at 5% level of significance

Δ = Percentage of raw

$\Delta\Delta$ = Percentage of column

Bishnoi Manmeet, Sisodia S.S., Kumar Vikas and Kumar Vinod

Further analysis of [Table-2] clearly shows that calculated chi-square value (14.579) is greater than tabulated value at 1 per cent level of significance. Therefore, the null hypothesis (NHo5) was rejected. This reveals that there is an association between education and adoption of Bt cotton production technology. It inferred that education play a significant role in adoption of Bt cotton production technology

Association between occupation and adoption of Bt cotton production technology
[Table-3] shows that out of total 120 respondents, 49 (40.83%) were reported their occupation as agriculture + labour, whereas, 40.00 per cent farmers having agriculture occupation and 19.17 per cent Bt cotton growers were to be found as agriculture + caste occupation in study area. Among the group of agriculture + labour, 09 (18.37%), 21(42.86%) and 19(38.78%) respondents possessed low, medium and high adoption of Bt cotton production technology, respectively. Similarly, from the agriculture occupation group, 16.67, 45.83 and 37.50 per cent Btcotton growers were kept in low, medium and high level of adoption of Bt cotton production technology, respectively. While, 6, 9 and 8 respondents of agriculture + caste occupation group were to be noted in low, medium and high level of Bt cotton production technology, respectively.

Table-3 *Association between occupation and adoption of Bt cotton production technology*

n=120

Occupation	Adoption of Bt cotton production technology			Total	χ^2
	Low	Medium	High		
Agriculture	8(16.67)$^\Delta$ (34.78)$^{\Delta\Delta}$	22(45.83) (42.31)	18(37.50) (40.00)	48(100) (40.00)	4.816 NS
Agriculture + labour	9(18.37) (39.13)	21(42.86) (40.38)	19(38.78) (42.22)	49(100) (40.83)	
Agriculture + caste occupation	6(26.09) (26.09)	9(39.13) (17.31)	8(34.78) (17.78)	23(100) (19.17)	
Total	**23 (19.17) (100)**	**52 (43.33) (100)**	**45 (37.50) (100)**	**120 (100)**	

NS = Non-significant
Δ = Percentage of raw
$\Delta\Delta$ = Percentage of column

Observation of the data in above [Table-3] further reveal that the calculated chi-square value (4.816) was less than tabulated value, therefore, the null hypothesis (NHo6) was accepted. This tends to conclude that there is no association between occupation and Bt cotton production technology.

Association between income level and adoption of Bt cotton production technology.
Hypotheses:
H_{04}: There is no association between income level and adoption of Bt cotton production technology.
RH_4: There is an association between income level and adoption of Bt cotton production technology.

Table-4 *Association between income level and adoption of Bt cotton production technology*

n=120

Income level	Adoption of Bt cotton production technology			Total	$+\chi^2$
	Low	Medium	High		
Low (<`10,000/Yr)	8 (22.22)$^\Delta$ (34.78)$^{\Delta\Delta}$	18(50.00) (34.62)	10 (27.78) (22.22)	36 (100) (30.00)	6.734 NS
Medium (`10,000-50000/Yr)	9 (16.07) (39.13)	25 (44.64) (48.08)	22 (39.29) (48.89)	56 (100) (46.67)	
High (>`50000/Yr)	6 (21.43) (26.09)	9 (32.14) (17.31)	13 (46.43) (28.89)	28 (100) (23.33)	
Total	**23 (19.17) (100)**	**52(43.33) (100)**	**45(37.50) (100)**	**120 (100)**	

NS =Non-Significant
Δ = Percentage of row
$\Delta\Delta$ = Percentage of column

[Table-4] shows that out of total 120 respondents, 28 (23.33%) were reported in high income group (>` 50,000/Yr) whereas, 30.00 per cent farmers were having low level of income (upto` 10,000/Yr) and 46.67 per cent Bt cotton growers were to be found in medium (`10,000 to 50,000/Yr) income group. Among the group of high income status, 06 (21.43%), 9 (32.14%) and 13 (46.43%) respondents possessed low, medium and high level of adoption of Bt cotton production technology, respectively. Similarly, from the medium income category, 16.07, 44.64 and 39.29 per cent Bt cotton growers were kept in low, medium and high level of adoption of Bt cotton production technology, respectively. While, 8, 18 and 10 respondents of low income group were to be noted in low, medium and high level of adoption of Bt cotton production technology, respectively.
Observation of the data in [Table-4] further reveal that the calculated chi-square value (6.734) was less than tabulated value, therefore, the null hypothesis (NHo6) was accepted. This tends to conclude that there is no association between income level and adoption of Bt cotton production technology.

Association between size of family and adoption of Bt cotton production technology
Hypotheses:
Ho5: There is no association between size of family and adoption of Bt cotton production technology.
RH5: There is an association between size of family and adoption of Bt cotton production technology.
[Table-5] shows that among 47 (57.50%) respondents of small family, 9 (19.15%), 23 (48.94%) and 15 (31.91%) respondents had low, medium and high level of adoption of Bt cotton production technology, respectively. Inlarge family among 73 (42.50%) respondents, 14 (19.18%), 29 (39.73%) and 30 (41.10%) per cent respondents possessed low, medium and high level of Bt cotton production technology, respectively.

Table-5 *Association between size of family and adoption Bt cotton production technology*

n=120

Size of family	Adoption of Bt cotton production technology			Total	χ^2
	Low	Medium	High		
Small family	9 (19.15)$^\Delta$ (39.13)$^{\Delta\Delta}$	23(48.94) (61.54)	15(31.91) (62.22)	47(100) (57.50)	7.278 NS
Large family	14(19.18) (60.87)	29(39.73) (38.46)	30(41.10) (37.78)	73 (100) (42.50)	
Total	**23 (19.17) (100)**	**52(43.33) (100)**	**45(37.50) (100)**	**120 (100)**	

NS = Non Significant
Δ = Percentage of row
$\Delta\Delta$ = Percentage of column

The calculated chi- square value (7.278) was less than tabulated value. Therefore, the null hypothesis (NHo7) was accepted. This non- significant value shows that there was no association between family size and adoption of Bt cotton production technology.

Association between type of family and adoption of Bt cotton production technology
Hypotheses:
H06: There is no association between type of family and adoption of Bt cotton production technology.
RH6: There is an association between type of family and adoption of Bt cotton production technology.
[Table-6] shows that among 51 (42.50%) respondents of nuclear family, 10 (19.61%), 25 (49.02%) and 16 (31.37%) respondents had low, medium and high level of adoption of Bt cotton production technology, respectively. In joint family among 69 (57.50%) respondents, 13 (18.84%), 27(39.13%) and 29 (42.03%) per cent respondents possessed low, medium and high level of adoption of Bt cotton production technology, respectively.

Table-6 *Association between type of family and adoption of Bt cotton production technology*

n=120

Type of family	Adoption of Bt cotton production technology			Total	χ^2
	Low	Medium	High		
Nuclear family	10 (19.61)$^\Delta$ (43.38)$^{\Delta\Delta}$	25(49.02) (48.08)	16(31.37) (35.56)	51(100) (42.50)	5.299 ^{NS}
Joint family	13(18.84) (56.52)	27(39.13) (51.92)	29(42.03) (64.44)	69(100) (57.50)	
Total	**23 (19.17) (100)**	**52(43.33) (100)**	**45(37.50) (100)**	**120 (100)**	

NS = Non Significant

Δ = Percentage of row

$\Delta\Delta$ = Percentage of column

The calculated chi- square value (5.299) was less than tabulated value. Therefore, the null hypothesis (NHo7) was accepted. This non- significant value shows that there was no association between family size and adoption of Bt cotton production technology.

Association between cosmopolitan outlook and adoption of Bt cotton production technology.
Hypotheses:
Ho7: There is no association between cosmopolitan outlook and adoption of Bt cotton production technology.

RH7: There is an association between cosmopolitan outlook and adoption of Bt cotton production technology.

A study of [Table-7] reveals that out of 120 respondents, 23 (19.17%), 61 (50.83%) and 36 (30.00%) farmers were recorded in low, medium and high level of cosmopolitan outlook category, respectively. Further analysis of table reveals that in low level of cosmopolitan outlook, 6 (26.09%), 7 (30.43%) and 10 (43.48%)Bt cotton growers possessed low, medium and high level of adoption of Bt cotton production technology, respectively. Whereas, in medium level of cosmopolitan outlook group, 9 (14.75%), 30 (49.18%) and 22 (36.07%) farmers were observed in low, medium and high level of Bt cotton production technology, respectively. In high level of cosmopolitan outlook, group 8(22.22%), 15(41.67%) and 13(36.11%) farmers had low, medium and high level of adoption of Bt cotton production technology, respectively.

Table-7 *Association between cosmopolitan outlooks and adoption of Bt cotton production technology*

n= 120

Level of Cosmopolitan outlook	Adoption of Bt cotton production technology			Total	χ^2
	Low	Medium	High		
Low (<7 score)	6 (26.09)$^\Delta$ (26.09)$^{\Delta\Delta}$	7(30.43) (13.46)	10(43.48) (22.22)	23(100) (19.17)	6.524 NS
Medium (7 to 12 score)	9 (14.75) (39.13)	30 (49.18) (57.69)	22 (36.07) (48.89)	61 (100) (50.83)	
High (>12 score)	8 (22.22) (34.78)	15 (41.67) (28.85)	13 (36.11) (28.89)	36 (100) (30.00)	
Total	**23 (19.17) (100)**	**52 (43.33) (100)**	**45 (37.50) (100)**	**120 (100)**	

NS = Non Significant

Δ = Percentage of row

$\Delta\Delta$ = Percentage of column

The calculated chi-square value (6.524) was less than tabulated value. Therefore, the null hypothesis (NHo9) was accepted. This non-significant value indicates that there was no association between the cosmopolitan outlook and adoption of Bt cotton production technology by the farmers.

Association between economic motivation and adoption of Bt cotton production technology

Ho8: There is no association between economic motivation and adoption of Bt cotton production technology.

RH8: There is an association between economic motivation and adoption of Bt cotton production technology.

Table 8 *Association between economic motivation and adoption of Bt cotton production technology*

n=120

Level of economic motivation	Adoption of Bt cotton production technology			Total	χ^2
	Low	Medium	High		
Low (<16 score)	8 (24.24)$^\Delta$ (34.78)$^{\Delta\Delta}$	15(45.45) (28.85)	10 (30.30) (22.22)	33 (100) (27.50)	5.472 NS
Medium (16-20 score)	9 (16.07) (39.13)	23 (41.07) (44.23)	24 (42.86) (53.33)	56 (100) (46.67)	
High (>20 score)	6 (19.35) (26.09)	14 (45.16) (26.92)	11 (35.48) (24.44)	31 (100) (25.83)	
Total	**23 (19.17) (100)**	**52 (43.33) (100)**	**45 (37.50) (100)**	**120 (100)**	

NS = Non Significant

Δ = Percentage of row

$\Delta\Delta$ = Percentage of column

[Table-8] indicates that out of 120 respondents, 27.50, 46.67 and 25.83 per cent farmers recorded in low, medium and high level of economic motivation respectively. The table also shows that among high level of economic motivation, 6 (19.35%), 14 (45.16%) and 11 (35.48%) respondents possessed low, medium and high level of adoption of Bt cotton production technology, respectively. In low level of economic motivation, 8, 15 and 10 farmers were in low, medium and high level of adoption of Bt cotton production technology, respectively. Whereas, in medium economic motivation group, 16.07, 41.07 and 42.86 per cent farmers were observed in low, medium and high adoption of Bt cotton production technology, respectively.

The calculated chi-square value (5.472) was less than tabulated. Therefore, the null hypothesis (NHo7) was accepted. This non-significant value shows the preposition that there was no association between economic motivation of respondents and adoption of Bt cotton production technology.

Association between extension contact and adoption of Bt cotton production technology
Hypotheses:
H9: There is no association between extension contact and adoption of Bt cotton production technology.

RH9: There is an association between extension contact and adoption of Bt cotton production technology.

Table-9 *Association between extension contact and adoption of Bt cotton production technology by farmers*

n = 120

Level of extension contact	Adoption of Bt cotton production technology			Total	χ^2
	Low	Medium	High		
Low (< 4 score)	7 (23.33)$^\Delta$ (30.43)$^{\Delta\Delta}$	13 (43.33) (25.00)	10 (33.33) (22.22)	30(100) (25.00)	6.444 NS
Medium (4-6 score)	10 (18.52) (43.48)	20 (37.04) (38.46)	24 (44.44) (53.33)	54 (100) (45.00)	
High (>6 score)	6 (16.67) (26.09)	19 (52.78) (36.54)	11 (30.56) (24.44)	36 (100) (30.00)	
Total	**23 (19.17) (100)**	**52 (43.33) (100)**	**45 (37.50) (100)**	**120 (100)**	

NS = Non Significant

Δ = Percentage of row

$\Delta\Delta$ = Percentage of column

The data incorporated in [Table-9] show that out of 120 respondents, 30 (25.00%), 54 (45.00%) and 36 (30.00%) farmers were noted in low, medium and high level of extension contact category, respectively. Table further shows that in low level of

extension contact, 7, 13 and 10 Btcotton growers possessed low, medium and high level of adoption of Bt cotton production technology, respectively. In medium level of extension contact, 10 (18.52%), 20 (37.04%) and 24 (44.44%) farmers recorded in low, medium and high level of adoption of Bt cotton production technology, respectively. Whereas, in high level of extension contact, 16.67, 52.78 and 30.56 per cent Bt cotton growers were in low, medium, high level of adoption of Bt cotton production technology, respectively.

Further analysis of [Table-9] reveals that calculated chi-square value (6.444) was less than tabulated value. Thus, null hypothesis (NHo$_{10}$) was accepted. This non-significant value reveals that there was no association between extension contact of the respondents and adoption of Bt cotton production technology. It means the extension contact dose not play any significant role with adoption Bt cotton production technology.

Conclusion

It was found that personal characteristics of the respondent's *viz.*, age, occupation, annual income, size of family, type of family, cosmopolitan outlook, economic motivation, and extension contact had non-significant association with adoption of Bt cotton production technology. While Education played a significant association with the adoption of Bt cotton production technology.

Acknowledgement

The authors are heartily thankful to Department of Extension Education, Rajasthan College of Agriculture, Maharana Pratap University of Agriculture and Technology, Udaipur, Rajasthan 313001 for providing data collection facilities and also thankful Dr. F.L. Sharma (HOD) for providing the facilities for the investigation.

Author Contributions: All author equally contributed

Abbreviations:
% - Per cent
et al. - et alibi (& elsewhere)
f - Frequency
NS -Non Significant
n - Number of responden

Conflict of Interest: None declared

References

[1] Asiwal B. L., Singh S. and Sharma N. K. (2013) *Indian Journal of Extension Education*, 21, 105-108.

[2] Kumar V., Sisodia S.S., Choudhary K.C., and Tiwari B. (2016) *International Journal of Agriculture Sciences*, 8(57), 3154-3157.

[3] Bishnoi M., Sisodia S.S., Kumar V. and Kumar V. (2016) *International Journal of Agriculture Sciences*, 8(60), 3353-3356.

[4] Bishnoi M., Sisodia S.S., Kumar V. and Kumar V. (2017) *International Journal of Agriculture Sciences*, 9(9), 3933-3936.