

Consumer and Growers Awareness towards Artificial Ripening of Fruits using Hazardous Chemicals in Some Selected Areas in Bangladesh

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Paper Received on February 03, 2017, Accepted on March 21, 2017 and Published Online on April 01, 2017

ABSTRACT

This research was undertaken to explore the consumers and grower's awareness using hazardous chemicals to ripen fruits. Data were collected from Dinajpur sadar selecting 30 Litchi growers from Dinajpur as well as 30 Mango growers from Rajshahi in Bangladesh following the random sampling procedure. Eighty consumers were selected from Dhaka metropolitan area in Bangladesh for describing consumer awareness. Data were collected from June 3 to August 18, 2013, through using personal interview schedule and focus group discussion. Data revealed that fruits growers use calcium carbide, ethephene and sulphur dioxide fumigants as ripening chemicals. Survey results show that 80 per cent grower read the labels on the package, and 70 per cent of them follow the instruction written on label. Respondents opined that 72 per cent seek help if they fail to understand writing on the label and 74 per cent of them are aware of the toxicity level of chemicals used for fruit ripening. Also, respondents opined that 85 per cent of the respondents do not eat, drink or smoke while spraying and 67 per cent take bath right after spraying, and 83 per cent of them keeps the chemical bottle far from food stuffs, as well as 85 per cent of them does not store food items in the bottle after using chemical. In addition, 66 per cent of the growers do not wash the bottle or sprayer in public reservoir of water eg. pond, canal, river etc., and 55 per cent of them do not attend any training on chemical use for ripening fruits. Besides, survey results regarding consumer awareness show that 65 per cent of the respondents prefer local produced fruits eg. mango, banana, litchi, guava etc., 60 per cent of the consumer knows about ripening immature fruit using toxic chemical, as well as 55 per cent has idea that scrupulous people use hazardous chemical for ripening fruits. In addition, same per cent of the respondents do not eat if they know the fruits actually ripened using chemical, while 24 per cent opined they do not hesitate to eat even after knowing. Almost half proportion (52%) have idea regarding having diseases due to eating ripened fruits. Fifty six per cent consumers do not think law enforcement agent activities are sufficient for discouraging using hazardous chemical ripening fruits. Some 72 per cent respondents think chemical test of fruit is necessary.

Key words: Awareness; Ripening of fruits; Hazardous chemicals;

Mango (*Mangifera indica*) and Litchi (*Litchi chinensis* Sonn) traditionally are very popular and delicious fruits in Bangladesh. These are seasonal fruits that grow across the country. Ripened fruits are the symbol of gift in Bangladeshi tradition and culture. People offer these as a gift when they visit relative's house or ailing patient. However, nowadays, there is serious allegation that vendors, growers and wholesalers are rampantly adulterating the fruits for getting mere economic benefit risking the consumers' health;

especially, pregnant and lactating mothers as well as children are the worst victim of consuming toxic chemically treated fruits.

However, only the fruit has a variety of pleasant and attractive flavor with their elusive coloring, those please the eye as well as the plate. By using modern transportation and chain management structure, it is possible to have fresh fruits around the year, in both the places where it can be grown and where it is not grown. The nutritive value of fruits has make it as best natural

food for all. It provides most of the vitamins and minerals to human body when taken after ripening. Ripening is a physiological process by which the fruit became much suitable for consuming. It also makes the fruit palatable and nutritious. Through the ripening process, a series of physiological and biochemical changes occurs which leads to change in color, flavor, texture and aroma that makes the fruits both tasty and attractive. It imparts numerous quality and nutritional characteristics to fruits which are an important element of the human diet (*Payasi and Sanwal, 2005*). It is a natural process in fruits that causes them to become fit for human consumption. In general, a fruit becomes sweeter, less green in color and softer when it ripens. Though, the acidity of the fruit rises during ripening, the fruit still tastes sweeter (*Rahman et al., 2008*).

It's a matter of concern that now a days artificial ripening is done to achieve faster and more uniform ripening characteristics by using different types of chemicals (*Medlicott et al., 1987*). In this way, fruits are being contaminated by chemicals which can cause serious health hazards. Toxic chemicals are extensively used to grow, ripen and make fruits appear fresher and last longer, especially during early and off season for better consumer acceptance and better marketing. Throughout marketing system both producers and wholesalers are using different types of chemicals unconsciously for keeping the fruits fresh or ripen them quickly. Whereas it is tough to ascertain the optimum use of these chemicals, so excess use of chemicals has become a common phenomenon. The growers are affected first by the chemicals, and the consumers being affected consequently. Environmentalists and nutritionists have warned that if the use of chemicals and hormones are increased by the whole sellers and farmers in the farming, harvesting, storing, transporting and marketing carelessly, food adulteration might also be increased tremendously. In this concern, *Murakami (1991)* stated that for the survival of human kind, this cannot be allowed to continue.

However, very limited research activities have so far been done in Bangladesh to explore the awareness of consumers and growers on using hazardous agrochemicals and hormones for fruit ripening and processing. Therefore, it became the researchers concern to find out the real scenario about the awareness of consumer and growers regarding artificial ripening of fruits using hazardous chemicals. However, the purposes of this research were to-describe the socio-

economic characteristics of the growers and consumers; explore the chemicals and growth hormones are using for fruit ripening, during post-harvest disease management; and marketing; as well as find out the extent of awareness among consumers as well as growers about harmful effect of chemicals used in post-harvest fruits management.

METHODOLOGY

The study was conducted in different selected district of Bangladesh. For collection of data from fruit consumers, Dhaka metropolitan area as the capital city of Bangladesh was selected purposefully as area of the study. On the other hand, for collecting of data from the fruit growers' areas were selected giving priority where major fruits are grown in huge amount. For example, Rajshahi and Dinajpur were selected to collect data from mango and lychee growers, respectively.

Two major fruits growers and consumers were considered as the population for this piece of research purposefully eg. mango and litchi. Among the population, data were collected from 80 consumers in Dhaka city following accidental sampling (*Boxill et al. 1997*). In addition, data were collected from 60 growers of mango and litchi (30 from each) following snowball-sampling procedure from Rajshahi and Dinajpur, respectively (*David, 2008*). Data were collected from June 3 to August 18, 2013. Qualitative data was collected to describe chemical using for ripening mango and litchi. Some relevant statements were being considered for exploring growers as well as consumers' awareness.

Primary data were collected using pretested semi structured interview schedule. Collected data were analyzed with the help of SPSS computer package program.

RESULTS AND DISCUSSION

Some Personal and Economic Characteristics of consumers : Data presented in Table 1 shows that range of age of respondents is 16 to 65 years old. Around half proportion of the respondents (47.5%) are middle age group, where 40 per cent are young aged and only 12.5 per cent are old aged. In case of education, 45 per cent consumers have secondary education, only 2.5 per cent respondents found to be signed, but no respondents found to be illiterate. Interestingly, mean education of consumer is 7.52 year of schooling, which is almost double from national average (4.5 years of schooling). Probably it is happened because data were collected from Dhaka city dwellers where average year of school

attendance is higher than national average. Range of family size is 2 to 9 in number. Average family size is 4.1 which are below than national average 4.6 (BBS, 2011). It indicates the practice of adopting of family planning is higher in city area than rural area. Average family income is 200.8 thousand BD Tk. that is slightly higher than national urban average 197.7 thousand (WB, 2011).

Some Personal and Economic Characteristics of mango growers : Data presented on Table 2 indicates that range of mango grower age is 25 to 68 years in the study area. Half proportion of the respondent (50%) is middle aged. Young and old aged portion are almost

similar; the figures are 25.3 and 26.64 per cent, respectively. Average age of mango growers in study area is 48 years old. In case of education, average year of schooling is 5.14 grades, which is higher than average national level 4.14. It is possible because education and adoption of technology have positive relation and educated people are much more innovative than low educated or illiterate people. Almost, half proportion of the respondents (46.62%) attended primary education, 29.97 per cent completed secondary level of education, and 13.32 per cent is higher educated. The range of family size of mango grower is 2 to 10 number and average is 5.1 numbers. Average family size is slightly

Table 1. Salient feature of consumer (N= 80)

Characteristics	Observed score	Categories	No.	%	Mean	SD
Age	16-65	Young (up to 35)	32	40	35.87	4.56
		Middle aged (35-50)	38	47.5		
		Old aged (above 50)	10	12.5		
Education	0.5-17	Can sign only (0.5)	2	2.5	7.52	1.95
		Primary (1-5)	13	16.2		
		Secondary (6-10)	36	45		
		Higher secondary (> 10)	20	25		
		Tertiary	9	11.25		
Family size	2-9	Small family (below 4)	58	72.5	4.1	1.18
		Medium family (5-7)	20	25		
		Large (above 7)	2	2.5		
Family annual income	12.0-960	Low (up to 150)	12	15	200.76	7.65
		Medium(>150-250)	57	71.25		
		High (> 250)	11	13.75		

Table 2. Salient feature of Mango Grower (N= 30)

Characteristics	Observed score	Categories	No.	%	Mean	SD
Age	25-68	Young (up to 35)	7	25.3	48	3.25
		Middle aged (>35-50)	15	50		
		Old aged (above 50)	8	26.64		
Education	0-12	Illiterate	01	3.33	5.14	1.17
		Can sign only (0.5)	02	6.66		
		Primary (1-5)	14	46.62		
		Secondary (6-10)	9	29.97		
		Higher secondary > 10)	4	13.32		
Family size	2-10	Small family (below 4)	7	23.31	5.1	1.34
		Medium family (5-7)	18	59.94		
		Large (above 7)	5	16.65		
Family farm size	0.2-7.0	Small(0.2-2.0ha)	9	29.97	2.6	1.05
		Medium(>2.0-4.0ha)	16	53.28		
		Large (>4.0ha)	5	16.65		
Family annual income	15.5-600	Low (up to 100)	6	19.98	165	15.56
		Medium (>100-200)	14	46.62		
		High (> 200)	10	33.3		

higher than average national level 4.6 (BBS, 2011). Average farm size of mango growers in study area is 2.6 hectare. Average family income is 165 thousand BDT in a year that is slightly higher than national average family income 137.8 thousand BDT (WB, 2011). Most of the mango growers are commercial entrepreneur. That is why, their average income is high.

Individual Characteristics of Litchi grower: Data included in Table 3 expresses that the age of litchi growers ranged from 26 to 65 years old. Average age of respondents is 46.54 years. Range of education of the respondents 0 to 12 grades and average of education enrollment class is 4.95. The four fifth proportion of the respondents (80%) attended school. The average family size, farm size and family income are 5.53, 2.25 ha. and 154 thousand, respectively (Table 3).

Chemical using for ripening mango and litchi: We asked fruit growers to know what kind of ripening materials they use but most of the farmer avoided this question, rather they informed us not using any chemicals. Very few farmers on condition for not disclosing their name, told us they use some chemical naming calcium carbide and ethephon. Also, we verified this information talking with local vendors regarding these chemical. In this regards, vendors wanted to skip this question fear of facing raid from law enforcing agency. It is mentionable here that recently government of Bangladesh banned using these chemical by making law giving death sentences as maximum punishment to the perpetrator. Therefore, growers those who use these

chemical-ripening fruits could no admit publicly fear of lawsuits and fine and punishment. However, we have learned secretly that growers use different chemicals namely calcium carbide, ethephon, sulfur dioxide fumigation etc. Growers informed us they apply that chemical so that fruits do not ripen in scattered way. In this regard, one of the growers told 'we use chemical to maintain uniform ripening of the fruits'. Some growers informed us that chemical helps giving attractive colour of the peel of the fruits that increase the market value. In addition, they opined that chemical is used for increase self-life of the fruits. Besides, chemical helps to reduce the losses from rooting of the fruits due to long time stored and travelling. Also, we talked with some horticulturist about this issue and they grossly acknowledge that fruit growers use those chemicals. Moreover, we discussed about the harmful consequence of using chemicals for ripening fruits. They informed us chemical like calcium carbide, ethephon these could damage kidney, heart and liver and even may cause gastric and ulcer if human body consume repeatedly.

Growers' awareness on using chemical ripening fruits : Data presented in Table 4 indicates 80 per cent grower read the package of fruit ripening chemical before using where only 20 per cent did not read. The majority of the respondents (70%) follow the instructions given on the label but almost one third (30%) did not follow. Also, 72 per cent respondents opined that they seek help if they fail to understand writing on the label, but 28 per cent did not ask for help. Majority of the

Table 3. Salient feature of Litchi Grower (N= 30)

Characteristics	Scoring method	Observed score	Categories	Respondents No.	%	Mean	SD
Age	Number of years	26-65	Young (up to 35)	5	16.65	46.54	4.12
			Middle aged (>35-50)	14	46.62		
			Old aged (above 50)	11	36.63		
Education	Years of schooling	0-12	Illiterate	02	6.66	4.95	1.05
			Can sign only (0.5)	04	13.32		
			Primary (1-5)	13	43.29		
			Secondary (6-10)	7	23.31		
			Higher secondary (> 10)	4	13.32		
Family size	Number of members	2-10	Small family (below 4)	8	26.64	5.53	1.54
			Medium family (5-7)	15	49.95		
			Large (above 7)	7	23.31		
Family farm size	Size in hectares	0.2-7.0	Small (0.2-2.0ha)	11	36.67	2.25	1.15
			Medium (>2.0-4.0ha)	12	39.96		
			Large (>4.0ha)	7	23.31		
Family annual income	In Taka ('000 Tk)	15.5-600	Low (up to 100)	8	26.64	154	16.34
			Medium (>100-200)	15	49.95		
			High (> 200)	7	23.31		

respondents (74%) were aware about the toxicity level of chemical used for fruit ripening, while only 26 per cent did not aware. Apart from these, 65 per cent respondents were understood about the toxicity level, whereas 35 per cent did not. When researcher asked them weather they eat, drink or smoke while spraying chemical. In response, 85 per cent opined ‘no’ and 15 per cent opined ‘yes’. In addition, 67 per cent respondents opined that they take bath right after spraying, while 23 per cent did not do so. Also, 62 per cent of the respondents opined that they change clothes right after spraying, while 38 per cent did not change clothes. The majority of the respondents did not keep the chemical bottle along with food items; the figure was 83 per cent, while 17 per cent did it. Most of the respondents did not store food items in chemical bottle after using; the figure was 85 per cent; while 15 per cent did it. When we asked respondents weather they wash the sprayer or bottle in the pond, canal, river or any open water sources, then 66 per cent replied ‘no’, while only 34 per cent replied ‘yes’. Moreover, 55 per cent of the respondents opined that they did not take part any training classes, while 45 per cent took part training classes (Table 4).

Consumers’ awareness on using chemical ripening fruits: Respondents were asked to opine according to the different options given as per the suitability of the statements. For the close form of questions – three options were considered, such as yes, no and no comments. However, for WH types or open form of questions – different options were considered as per the statement (Table 5).

Data placed in Table 5 shows that 34 per cent respondents prefer guava, kul, citrus; and 31 per cent like mango, banana, litchi fruits. It shows majority (65%) of the respondents preferred eating local produced fruits, while 30 per cent respondents preferred imported fruits eg. apple, grape etc. and 5 per cent respondents ate other fruits. When we asked the respondents whether they know anything about ripening immature fruits using toxic chemical, subsequently, overwhelming majority (60%) opined yes, while 34 per cent opined no and only 6 per cent did not have any comments. Again, we asked them weather they have idea that scrupulous people use hazardous chemical for ripening fruits, 55 per cent opined yes, while 31 per cent opined no and only 14 per cent had no opinion. In addition, 43 per cent, 40 per cent, 12 per cent and 5 per cent of the respondents knew about the harmful health hazards of eating

Table 4. Growers’ awareness about using chemical fruit ripening (N= 60)

Particulars	Respondents %	
	Yes	No
Do you read carefully the tags on the package?	80	20
Do you follow the info. given on the tags?	70	30
If you fail to understand, do you ask help from others?	72	28
Are you conscious of harmfulness of chemical used for fruit ripening?	74	26
Are you able to understand the level of toxicity, reading the sign on the label?	65	35
Do you eat, drink or smoke while spraying chemicals?	15	85
Do you take bath immediately after spraying?	67	23
Do you change clothes right after spraying?	62	38
Do you keep the chemical bottle far from food items?	17	83
Do you keep food items in chemical bottle after use?	15	85
Do you wash the sprayer/bottle in the pond/canal/river/others?	34	66
Have you participated in any training/ workshop/discussions on chemical use for ripening fruits?	45	55

chemical treated of ripened fruits through electronic, print media, friend and peers, other sources, respectively. When respondents were asked if they know the fruits actually ripened using chemical and if they eat them, then 55 per cent replied no, 24 per cent yes and 21 per cent had no opinion, respectively (Table 5). In addition, 52 per cent had experiences regarding having diseases due to eating toxic chemical treated ripened fruits, while 32 per cent did not have, and 16 per cent had no opinion. Almost half proportion (45%) opined, they did not have experience having diseases of their relatives after eating artificial chemical treated fruits, but 23 per cent had experience, while 32 per cent did not have any idea. In addition, 56 per cent of the respondents do not think that law enforcement agent activities are sufficient to reduce using toxic chemicals for ripening fruit by the growers and retailers, but 32 per cent think sufficient, while 12 per cent did not have any opinion. Furthermore, 72 per cent of the consumers think regular chemical test of fruits is necessary, but only 8 per cent did not think so, while 20 per cent did not have any opinion.

CONCLUSION

Socio-economic condition of fruits grower is better

Table 5. Consumers' awareness on eating chemical treated of ripened fruits (N= 80)

Statements	Response of respondents & distribution (%)			
	Local produced Guava, kul, citrus (34)*	Local produced produced Mango, Banana, Litchi (31)	Imported Apple, orange, grape etc. (30)	Other fruits (5)
Do you know anything about ripening immature fruit using toxic chemical?	Yes (60)	No (34)	No comments (6)	
Do you have idea that scrupulous people use hazardous chemical for ripening fruits?	Yes (55)	No (31)	No comments (14)	
If answer of question number 3 is yes, how could you know?	Through elect- ronic media (43)	Print media (40)	From friends and peers (12)	Others (5)
If you know- the fruit actually ripened using chemical then do you eat?	Yes (24)	No (55)	No comments (21)	
Have you got experiences ever having any health trouble due to eating toxic chemical treated fruits?	Yes (52)	No (32)	No comments (16)	
Have your relatives ever unfortunately affected with disease due to eating toxic chemical treated ripened fruits?	Yes (23)	No (45)	No comments (32)	
Do you think press media publication regarding this issue is sufficient?	Yes (55)	No (26)	No comments (19)	
Do you think law enforcement agent activities are sufficient to reduce using toxic chemicals for ripening fruit by the growers and retailers?	Yes (32)	No (56)	No comments (12)	
Do you think regular chemical test of fruit is necessary?	Yes (72)	No (8)	No comments (20)	

* Figure in the parentheses indicates percentage

than common people. Similarly, socio-economic condition of consumers in research area is better than other average people living in metropolitan area. Though, most of the growers are aware but some of them found to be carefree that is threaten to the public health safety. Those who are aware about the toxicity of the chemical but they

have no way to use getting extra money. Sometimes chemical helps to increase the self-life of the fruits and provides uniform ripening though they are toxic. Regarding consumer, most of the them are aware of the negative impact of these chemicals, but they are helpless have no way to consume fruits treated by toxic chemicals

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