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Attitude towards Artificial Fruit Ripening with Chemical Agents among Consumers in Rivers State

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A B S T R A C T

The study investigated attitude towards artificial fruit ripening with chemical agents among fruit consumers in Rivers State. The study adopted a descriptive cross-sectional survey design. Three research questions and two null hypotheses guided the study. A sample size of 1050 fruit consumers was drawn from different communities in Rivers East Senatorial District of the state using multi-stage sampling procedures. A validated self-structured questionnaire titled 'Consumers' Attitude towards Artificial Fruit Ripening' with inter-scale reliability co-efficient of 0.80 was used as instrument for data collection. The data were analyzed using descriptive statistics of mean and standard deviation to answer the research questions, while inferential statistics of Analysis of Variance was used to test the hypotheses at 0.05 alpha level. The results of the study showed that the fruit consumers displayed positive attitude towards artificially ripened fruits with a cluster mean of 2.55; SD:1.01; and the demographic variables of age and level of education had significant influence on their attitude. The study therefore recommended among others that, health educators and public health workers should liaise with Rivers State Ministry of Information and Communication to engage in massive education and awareness campaign on the need to eat healthy fruits, and avoid consumption of fruits ripened or suspected to be ripened with chemically fruit-ripening agents..

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Introduction

In recent times, fruits are artificially ripened using various chemical ripening agents in order to satisfy their increasing demand, overcome transportation damage and maximal profits by farmers and fruit vendors. Studies have identified notable chemical fruit ripening agents commonly used for artificial ripening of fruits. Some of these chemical fruit ripening agents include ethylene and methyl jasmonate, ethylene glycol, ethephon, ethanol, ethanol, and calcium carbide (Goonatilake, 2008)[5]. Sadly, these chemical ripening agents have been associated with serious health effects on consumers.

In some developed countries, application of these fruit ripening agents on some specific fruits are done under controlled conditions to reduce the hazardous health effects, while in others countries, the use of these agents in fruits ripening is outrightly banned for health purposes, and their effect on the nutritive quality of fruits. Mursalat et al, (2013)[12]noted that a very small concentration (1 ppm) of ethylene in air is sufficient to promote fruit ripening process. The application of ethylene requires high precautionary measures due to its explosive nature (Ur-Rahman et al., 2008)[20], and the commercial use of it for fruit

ripening initiates climacteric (Eze, 2021)[4].

It is disturbing that in most developing countries including Nigeria, these dangerous chemical fruit ripening agents are commonly and indiscriminately used to force-ripe fruits, without qualms of the health consequences, and controlby government and food regulatory agencies. Ogundipe (2018)[14]and Siddiqui and Dhua (2010)[18]reported that low-cost chemicals such as calcium carbide, ethylene glycol and ethephon are reportedly used in to trigger ripening process in developing countries like Bangladesh, India, Sri-Lanka, Pakistan, including Nigeria. Similarly, Opare (2016)[15]and Oche (2014)[13]also noted an upsurge in reported case of particular uses of carbide-ripened fruits in Kenya, Ghana, and Nigeria. The commonly fruits ripened with these chemical ripening agents are banana, orange, plantains, paw-paw, mango, lemons, pineapple and others.

Recently, in Nigeria, it has reported and observed that substantial amount of calcium carbide is being used to force-ripe fruits by both farmers and fruit vendors in every nook and crane of the country (Vincent et al., 2018)[21]. Major markets big cities in Nigeria have been discovered to be hubs of sale of chemically ripened fruits to unsuspecting buyers and consumers. These markets include Zuba International market and Maraba fruit market in Abuja and others in Benin city and others cities (Vincent et al., 2018; Igbinaduwa et al., 2018)[21,8].This development of use of the chemical fruit ripening agents in Nigeria could be attributed to a number of factors ranging from bid to meet increasing demand, desire of unscrupulous farmers and fruits vendors make profits at the expense of the health of the public, freelance attitude of people of what they buy and consume, poor knowledge of the harmful effects of consuming artificially and chemically ripened fruits, and failure government and food regulatory agencies to monitor and supervise what sell to the public. These lapses have led to open display of these 'killer' chemically ripened fruits at strategic places and positions to attract buyers and consumers, without any checks, and recourse to the effect on the public health.

Disastrous consequences of consumption of chemically ripened fruits have been revealed by many studies. Igbinaduwaet al.(2018)[8] and Ogundipe (2018)[14]stated that growing use of chemically fruit ripening agents and regular consumption of fruits ripened with chemical agents have implicated with increasing case of different health problems such as cancers. Pregnant women are been found to vulnerable to chemical residues in fruit ripened with chemical agents as these residues could lead to miscarriage and adverse effect on the foetus (Dhembare, 2013)[3].Ethephon being one the commonly used fruit ripening agents causes inhibition of red cells and cholinesterase inhibition, respiratory depression, tightness in the chest fluids in lungs, dark vision (Proshad et al., 2018; Islam et al., 2018)[16,9].

Consumption of carbide-ripened fruits is a big threat too human health. Ingestion of fruits ripened with carbide causes gastrointestinal burn, nausea, stomach upset, vomiting and bloating, disruption of intestinal functions, proliferation of bacteria causing severe diarrhea with or without blood, peptic ulcers (Siddiqui &Dhua, 2010)[18], esophagitis, gastritis, and hepatic steatosis, neurological implications due to carbide gas (Mahmood, et al., 2013)[11]. Eze (2021)[4] added that chronic arsenic exposure presents mild weakness of essential muscle of the extremities, irritation of respiratory mucosa.

Due to increased knowledge of health value of fruits, and desire of people to maintain healthy life, a good percentage of people buy and consume different fruits on daily basis. Unfortunately, most of these fruits are artificially ripened with chemical ripening agents, like calcium carbide, ethephon and others with their inherent injurious effects on human health. Most worrisome, is the attitude of some consumers towards artificial fruit ripening. Many consumers of chemically ripened fruits are indifferent of the health consequences, and clearly display negative, freelance and nonchalant attitudes towards consuming chemically ripened fruits without minding the health implications. This set of fruit buyers and consumers are basically attracted to artificially ripened fruits due to their attractiveness or outward appearance, not necessarily, the safety and nutritive value of such fruits. Vincent et al. (2018)[21]state that most consumers do not think eating fruits ripened artificially will have any severe effect on their health. They possess such poor or negative attitude to healthy eating and think it is their faith that keep them from illnesses, and do not take any precautionary measure on type of fruits or food they consume. Some other consumers also feel that since they cannot have their own orchards, they are left with no other option but to buy artificially ripened fruits with chemical agents which are mostly available in markets (Rokonuzaman, 2017)[17].However, some other consumers are conservative and make careful choices of fruits they buy and

consume, considering the safety, nutritive quality, and natural and freshness of the fruits. This is considered positive attitude towards artificial fruit ripening. This set of consumers believe that using unnatural means, like chemical ripening agents to ripen fruits could be harmful to health.

It is most likely that some demographic variables like age, level of education, gender, religion, and other factors may influence people's attitude towards artificial fruit ripening. It is, therefore, worth investigating attitude towards artificial fruit ripening with chemical agents among consumers in Rivers State, branded as the Garden City in Nigeria.

Purpose of the Study

This study was aimed at assessing attitude towards artificial fruit ripening with chemical agents among fruit consumers in Rivers State. Specifically, the objectives were to:

1. ascertain the attitude towards artificial fruit ripening with chemical agents among consumers in Rivers State.
2. find out the attitude towards artificial fruit ripening with chemical agents among consumers in Rivers State with respect to age.
3. investigate the attitude towards artificial fruit ripening with chemical agents among consumers in Rivers State with respect to level of education.

Research Questions

The following research questions guided the study.

1. What is the attitude towards artificial fruit ripening with chemical agents among consumers in Rivers State?
2. What is the attitude towards artificial fruit ripening with chemical agents among consumers in Rivers State with respect to age?
3. What is the attitude towards artificial fruit ripening with chemical agents among consumers in Rivers East Senatorial District with respect to level of education?

Hypotheses

The following hypotheses were postulated and tested at 0.05 level of significance.

1. There is no significant difference in attitude towards artificial fruit ripening with chemical agents among consumers in Rivers State with respect to age.
2. There is no significant difference in attitude towards artificial fruit ripening with chemical agents among consumers in Rivers State with respect to level of education.

Methodology

A cross-sectional descriptive survey research design was used for this study. The population of the study was2, 617,600 respondents comprising all the fruit consumers in six selected metropolitan Local Government Areas (LGAs) with major fruit markets in Rivers East Senatorial district. (National Population Commission, 2016 Population Projection).Multi-stage sampling procedures were used to obtain a sample size of one thousand and twenty-four (1,050) fruit consumers from 25 communities in the six selected metropolitan LGAs in the senatorial district. A self-structured questionnaire titled Consumers' Attitude towards Artificial Fruit Ripening (CAAFR) was used as the instrument for data collection. Copies of the questionnaire were administered and retrieved immediately to avoid low return rate and incomplete data. 1024 copies of the questionnaire were completed and retrieved giving a return rate of 97.5%. The inter-scale reliability co-efficient of 0.804 was established using Cronbach alpha in conjunction with Spearman-Brown Correction Statistics. Descriptive statistics of mean and standard deviation were used to analyse data for the research questions and the hypotheses were tested using Analysis of Variance (ANOVA) at 0.05 level of significance. A criterion Mean of 2.50 was used in taking decision for attitude. Any item Mean, Mean Set or Cluster Mean equal to or greater than 2.50 was considered as "positive attitude" while any item Mean Set or Cluster Mean less than 2.50 was considered

as “negative attitude”.

Results and Discussion

Research Question 1: What is the attitude towards artificial fruit ripening with chemical agents among consumers in Rivers State?

Table 1: Attitude of consumers in Rivers State towards artificial fruit ripening with chemical agents

S/N	ITEMS	Consumers (n=1024)		
		$\bar{X}$	SD	Remark
1	1. I eat fruits ripened with chemicals because they are not harmful.	2.25	1.10	Negative
2	2. I believe that chemicals added to fruits are only harmful to consumers and not vendors.	2.17	0.96	Negative
3	3. I prefer eating attractive fruits irrespective of how they have been ripened.	2.82	1.04	Positive
4	4. Ripening fruits with small quantity of chemicals such as carbide doesn’t cause harm.	2.36	0.94	Negative
5	5. I believe that fruit ripening chemicals do not in any way reduce the nutritional quality of the fruits in terms of nutrients and flavour.	2.36	1.04	Negative
6	6. I am not bothered about fruits ripening chemicals because they cannot enter the flesh of the fruits; therefore, they can cause harm.	2.27	1.02	Negative
7	7. To meet the increasing demand on fruits and minimise losses, fruit ripening chemicals must be used to fasten the ripening process.	2.22	0.94	Negative
8	8. I am not observant when buying fruits because I find it difficult to differentiate naturally ripened fruits from the chemically ripened ones.	2.88	0.99	Positive
9	9. I live in the city therefore cannot help but buy fruits that have been ripened with chemicals.	2.38	1.08	Negativ e
10	10. I don’t worry about what I eat. I just put my faith in God.	2.68	1.14	Positive
11	11. I believe that using chemicals like carbide in fruit ripening is tantamount to murder.	2.52	1.04	Positive
12	12. It is advisable to buy fruits from reputed vendors as they are likely to be safer for consumption than fruits bought from unknown vendors.	2.97	0.98	Positive
13	13. It is good to have my own garden so as to reduce the risk of eating artificially ripened fruits.	2.95	0.92	Positive
14	14. I see buying of unripe fruits and allowing them to ripen naturally as a sure way to avoid eating artificially ripened fruits.	2.52	1.05	Positive
15	15. I am careful of the harmfulness of chemicals used in fruit ripening.	2.95	0.89	Positive
	Grand mean	**2.55**	**1.01**	**Positive**

*>2.50 = Positive, *<2.50 = Negative

The results in table 1 showed that the respondents displayed negative attitude to seven items, and exhibited positive attitude to eight items. The table further revealed the grand Mean of 2.55; SD: 1.01 which was greater than the criterion Mean, which implied that generally,the consumers exhibited positive attitude towards artificial fruit ripening with chemical agents. The results of the table also indicated that substantial number of consumers in the senatorial district had negative attitude towards artificial fruit ripening with chemical agents considering the lean grand Mean of 2.55

Research Question 2: What is the attitudetowards artificial fruit ripening with chemical agents among consumers in Rivers State with respect to age?

Table 2: Attitude of consumers in Rivers State towards artificial fruit ripening with chemical agents with respect to age

S/N	Items	Less than 31 years (n=466)		31-40 yrs. (n=279)		41-50yrs (n=201)		51 yrs. &above (n=78)		Mean Set	Remark
		$\bar{X}$	SD	$\bar{X}$	SD	$\bar{X}$	SD	$\bar{X}$	SD		
1.	I eat fruits ripened with chemicals because they are not harmful.	2.30	1.06	2.19	1.14	2.09	1.22	2.62	0.72	2.30	Negative Attitude
2.	I believe that chemicals added to fruits are only harmful to consumers and not vendors.	2.28	0.97	2.25	1.03	1.83	0.81	2.05	0.79	2.10	Negative Attitude
3.	I prefer eating attractive fruits irrespective of how they have been ripened.	2.70	1.01	2.87	1.09	2.82	1.02	3.31	0.96	2.93	Positive Attitude
4.	Ripening fruits with small quantity of chemicals such as carbide doesn't cause harm.	2.49	0.90	2.25	1.04	2.08	0.84	2.79	0.83	2.40	Negative Attitude
5.	I believe that fruit ripening chemicals do not in any way reduce the nutritional quality of the fruits in terms of nutrients and flavour.	2.40	0.96	2.14	1.16	2.46	1.01	2.72	0.99	2.43	Negative Attitude
6.	I am not bothered about fruits ripening chemicals because they cannot enter the flesh of the fruits; therefore, they cannot cause harm.	2.27	0.96	2.18	1.02	2.15	1.11	2.85	0.94	2.36	Negative Attitude
7.	To meet the increasing demand on fruits and minimize losses, fruit ripening chemicals must be used to fasten the ripening process.	2.35	0.92	2.06	0.97	2.12	0.91	2.27	0.91	2.20	Negative Attitude
8.	I am not observant when buying fruits because I find it difficult to different naturally ripened fruits from the chemically ripened ones.	2.94	0.96	2.71	1.06	2.88	1.01	3.13	0.69	2.92	Positive Attitude
9.	I live in the city therefore cannot help but buy fruits that have been ripened with chemicals.	2.64	1.05	2.11	1.08	2.14	1.05	2.42	1.03	2.33	Negative Attitude
10.	I don't need to worry about what I eat. I just need to put my faith in God.	2.72	1.12	2.53	1.18	2.55	1.17	3.29	0.81	2.77	Positive Attitude

11.	I believe that using chemicals like carbide in fruit ripening is tantamount to murder.	2.58	1.07	2.53	1.03	2.48	1.01	2.24	0.97	2.46	Negative Attitude
12.	It is advisable to buy fruits from reputed vendors as they are likely to be safer for consumption than fruits bought from unknown vendors.	2.83	0.98	3.22	0.91	3.01	1.04	2.85	0.93	2.98	Positive Attitude
13.	It is good to have my own garden so as to reduce the risk of eating artificially ripened fruits.	2.83	1.00	3.05	0.98	3.01	0.69	3.23	0.66	3.03	Positive Attitude
14.	I see buying of unripe fruits and allowing them to ripen naturally as a sure way to avoid eating artificially ripened fruits.	2.62	1.09	2.66	1.08	2.27	0.82	2.05	0.87	2.40	Negative Attitude
15.	I am careful of the harmfulness of chemicals used in fruit ripening.	2.85	0.91	3.13	0.86	3.02	0.79	2.69	0.97	2.92	Positive Attitude
	Cluster Mean and Standard Deviation	**2..59**	**1.00**	**2.53**	**1.04**	**2.46**	**0.97**	**2.70**	**0.87**	**2.57**	**Positive Attitude**

Results in Table 2showed that the fruit consumers with all age range had more positive attitude towards artificial fruit ripening with respect to age except those within the age range of less than 31 years (n = 466). While the fruit consumers within the age range of 51 years and above (n = 78)had the highest mean value (2.70) indicating an outstanding positive attitude towards artificially ripened fruit with chemical agents in Rivers East Senatorial District. Summarily, the cluster mean value of 2.57 showed that the fruit consumers in Rivers East Senatorial District had positive attitude which is slightly above average grand mean. This, however, showed that other appreciable number of consumers in the district had negative attitude towards artificial fruit ripening with chemical agents.

Research Question 3: What is the attitude towards artificial fruit ripening with chemical agents among consumers in Rivers State based on level of education?

Table 4: Attitude of consumers in Rivers State towards artificial fruit ripening with chemical agents with respect to level of education

S/N	**Items**	**No Formal Education (n=26)**		**Primary Education (n=83)**		**Secondary Education (n=384)**		**Tertiary Education (n=531)**		**Mean Set**	**Remark**
		$\bar{X}$	**SD**	$\bar{X}$	**SD**	$\bar{X}$	**SD**	$\bar{X}$	**SD**		
1.	I eat fruits ripened with chemicals because they are not harmful.	1.79	1.07	2.36	1.08	2.81	0.87	3.04	0.34	2.50	Positive Attitude
2.	I believe that chemicals added to fruits are only harmful to consumers and not vendors.	2.15	1.05	2.27	0.96	2.12	0.81	2.85	0.61	2.35	Negative Attitude
3.	I prefer eating attractive fruits irrespective of how they have been ripened.	2.49	1.06	2.73	0.93	3.22	0.86	3.85	0.46	3.07	Positive Attitude

4.	Ripening fruits with small quantity of chemicals such as carbide doesn't cause harm.	1.96	0.89	2.80	0.85	2.78	0.80	3.00	0.40	2.64	Positive Attitude
5.	I believe that fruit ripening chemicals do not in any way reduce the nutritional quality of the fruits in terms of nutrients and flavour.	1.96	0.99	2.18	1.00	2.91	0.87	3.04	0.45	2.52	Positive Attitude
6.	I am not bothered about fruits ripening chemicals because they cannot enter the flesh of the fruits; therefore, they cannot cause harm.	1.80	0.94	2.40	0.92	2.82	0.83	3.12	0.43	2.54	Positive Attitude
7.	To meet the increasing demand on fruits and minimize losses, fruit ripening chemicals must be used to fasten the ripening process.	1.95	0.97	2.60	0.78	2.46	0.82	2.85	0.54	2.47	Negative Attitude
8.	I am not observant when buying fruits because I find it difficult to different naturally ripened fruits from the chemically ripened ones.	2.68	1.07	3.02	0.91	3.05	0.82	3.81	0.63	3.14	Positive Attitude
9.	I live in the city therefore cannot help but buy fruits that have been ripened with chemicals.	2.27	1.12	2.20	1.16	2.49	0.96	3.69	0.68	2.66	Positive Attitude
10.	I don't need to worry about what I eat. I just need to put my faith in God.	2.17	1.08	2.87	1.10	3.27	0.88	3.77	0.71	3.02	Positive Attitude
11.	I believe that using chemicals like carbide in fruit ripening is tantamount to murder.	2.74	1.00	2.75	0.97	2.19	1.03	2.23	0.86	2.48	Negative Attitude
12.	It is advisable to buy fruits from reputed vendors as they are likely to be safer for consumption than fruits bought from unknown vendors.	3.21	0.90	3.12	0.89	2.69	1.03	1.96	0.45	2.75	Positive Attitude
13.	It is good to have my own garden so as to reduce the risk of eating artificially ripened fruits.	3.03	0.94	3.48	0.65	2.78	0.90	2.35	0.69	2.91	Positive Attitude
14.	I see buying of unripe fruits and allowing them to ripen naturally as a sure	2.66	1.09	2.81	1.13	2.29	0.94	2.08	0.39	2.46	Negative Attitude

	way to avoid eating artificially ripened fruits.										
15.	I am careful of the harmfulness of chemicals used in fruit ripening.	3.13	0.85	3.17	0.79	2.65	0.91	2.92	0.39	2.97	Positive Attitude
	Cluster Mean and Standard Deviation	**2.40**	**1.00**	**2.72**	**0.94**	**2.70**	**0.89**	**2.97**	**0.54**	**2.70**	**Positive Attitude**

Results in Table 3 showed that all the fruit consumers having formal education in Rivers East Senatorial District had positive attitude towards artificial fruit ripening while those with no formal education had negative attitude. Though, the average cluster mean of 2.70 showed that they had fruit positive attitude towards artificial fruit ripening with chemical agents, level of education influenced their attitude greatly.

Hypotheses

Hypothesis 1: There is no significant difference in attitude towards artificial fruit ripening with chemical agents among consumers in Rivers State with respect to age.

Table 4: ANOVA analysis on difference in attitude towards artificial fruit ripening with chemical agents among consumers in Rivers State with respect to age

Variable	Sum of Squares	Df	Mean Square	F	Sig.	Decision
Between Groups	4.122	3	1.374	8.021	.000	Significant
Within Groups	174.739	1020	.171			
Total	178.861	1023				

Table 4showed that the calculated F-value for the fruit consumers' age is 8.021 at degrees of freedom of 3 and 1020 and probability level of 0.000 which is less than 0.05 level of probability ($F_{(3/1020)}$=8.021; P<.05). The hypothesis was therefore not retained. Therefore, age has a significant influence on the attitude of fruit consumers towards artificial fruit ripening in Rivers State.

Hypothesis 2: There is no significant difference in attitude towards artificial fruit ripening with chemical agents among consumers in Rivers State with respect to level of education.

Table 5: ANOVA analysis on difference in attitude towards artificial fruit ripening with chemical agents among consumers in Rivers State with respect to level of education

Variable	Sum of Squares	Df	Mean Square	F	Sig.	Decision
Between Groups	27.548	3	9.183	61.900	.000	Significant
Within Groups	151.313	1020	.148			
Total	178.861	1023				

Table 5 showed that the calculated F-value for level of education is 61.900 at degrees of freedom of 3 and 1020 and probability level of 0.000 which is less than 0.05 level of probability ($F_{(3/1020)}$=61.900; P<.05). The hypothesis was therefore not retained. Therefore, level of education has a significant influence on attitude towards artificial fruit ripening among fruit consumers in Rivers State.

Discussions

The findings of the study were discussed under the following sub-headings:

Attitude of Consumers towards Artificial Fruit Ripening with chemical agents

The findings in Table 1 showed the cluster Mean of 2.55; SD: 1.01 which is greater than the criterion mean, indicating that the consumers displayed positive attitude towards artificial fruit ripening with chemical agents. These findings were unexpected considering the high rates of patronizing fruit vendors by fruit buyers and consumers in Rivers State on daily basis which most of the fruits displayed for sale were chemically ripened to meet increasing demand. The findings in this table disagree with the findings of Rokonuzaman (2017)[17] which revealed that most of fruit consumers often displayed negative attitude towards artificial fruit ripening, not minding the health consequences of consuming fruits ripened with

chemical agents.The reasons for display of positive attitude towards artificial ripening by the respondents could be due to numerous health information and sensitization on many social media platforms, and increased awareness campaign on health protection and maintenance by various health agencies and organizations in collaboration with Ministry of Information, and Ministry of Health in the state. This campaign in the state followed recent prevalence of chronic and non-communicable diseases among the residents, suspected to be as results of air pollution due to upsurge of oil bunkering, and consumption of edibles contaminated with pollutants.

Attitude of Consumers towards Artificial Fruit Ripening with chemical agents with Respect to Age

The findings in Table 2 showed that the respondents had average mean response of positive attitude towards artificially ripened fruits. The Table established that fruit consumers within the age bracket of less than 31 who are 466 in number and fruit consumers within the age bracket of 31 to 40 years who are 279 in number have slightly above average mean response of positive attitude towards artificially ripened fruits in Rivers State. However, fruit consumers within the age range of 41 to 50 years who are 201 in number had negative attitude towards artificially ripened fruits while consumers within the age range of 51 years and above who are only 78 in number showed exceptional positive attitude towards artificially ripened fruits in Rivers State. This agrees with the findings of Desbouys, et al. (2019)[2]that consumers who are much younger in age had the highest consumption of nutrient-poor foods. In the same vein, Massaglia, *et al*. (2019)[10]acknowledged that 22% of consumers who are within the age range of 46-65 years made careful choices of fruits purchase and consumption. Massaglia and colleagues further noted that these consumers were particularly influenced by the intrinsic factors of fruit products: the origin having the highest average raw score (1.684), seasonality (average raw score 1.679), followed by the product freshness (average raw score 1.617). Other studies confirmed the importance given by these consumers to the freshness attribute as a driver for purchasing fruit and vegetables (Terano, *et al.,* 2016; Bhat, *et al.,*2015; Guerrero, *et al.,*2012)[19,1,6]. Therefore, it is appropriate to note that the positive attitude of fruit consumers to artificially ripened fruits in Rivers State depends on the age of the individual fruit consumer possibly due to their years of experience in fruit consumption in Rivers state as younger fruit consumers tend to have mix of attitude while the older ones were consistent.

Attitude of Consumers towards Artificial Fruit Ripening with chemical agents with Respect to Level of Education

The findings in Table 3 showed that the respondents had above-average response of positive attitude towards artificially ripened fruits. The Table established that fruit consumers having tertiary education who are 531 in number have outstanding positive attitude towards artificially ripened fruits in Rivers State followed by fruit consumers having primary and secondary education who are 83 and 384 in number respectively. However, fruit consumers with no formal education who are only 26 in number had negative attitude towards artificially ripened fruits in Rivers State. This again resonates with the findings of Hossain, et al. (2008)[7]who remarked that of the 110 consumers interviewed, Most of them (98.2%) had different levels of formal education ranging from primary school to post-graduate study. As a result, 63 (57.3%) were certain that many sellers/producers use hazardous chemicals in fruits ripening, 40 (36.4%) had heard about the use of hazardous chemicals and only seven (6.4%) were indifferent about it. Consequently, most (93%) of the consumers were not happy about the fruit ripening, as they emphasized that fruits ripened with chemicals were harmful to one's health. The remaining 4.5%, although they knew not whether fruits ripened with chemicals were harmful to one's health, indicated they would not consume such fruits if they knew that chemically treated foods were harmful to one's health (Hossain, *et al*., 2008)[7].So, it is appropriate to note that fruit consumers in Rivers State having formal education are certain, though at different degrees, of the implication of the consumption of artificially ripened fruits and therefore showed significant and positive attitude towards the consumption of artificially ripened fruits.

Conclusion

Based on the findings revealed of this study, it is concluded that fruit consumers in Rivers state, Nigeria had positive attitude towards artificial fruit ripening with chemical agents. Most noteworthy, is that the population of older consumers and those with tertiary education were more conservative and conscious in ensuring that artificially ripened fruits were identified and the consumption discouraged than their

younger and less educated counterparts.

Recommendations

Consequent upon the findings of the study, the following recommendations were made:

1. Public health workers should liaise with Rivers State Ministry of Information and Communication to engage in massive awareness campaign on the need to eat healthy fruits, especially on the part of the youthful and less educated populations.
2. There should be community health education programmes using different formal and non-formal social and community fora and settings to increase level of awareness and education on the health effects of using chemical agents to ripen fruits, and ways of identifying and avoiding consumption of such fruits.
3. Regulatory and legislative measures should be put in place by Food Regulatory Agencies to checkmate indiscriminate use of chemical agents to force-ripe fruits meant for human consumption. This harmful practice could be reduced or eradicated by regular visits to fruit markets and randomly collecting samples for analysis, and meting out severe punishment to offenders of such practice.

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