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# KNOWLEDGE OF THE HEALTH EFFECTS OF CALCIUM CARBIDE APPLICATION ON FRUITS FOR HUMAN CONSUMPTION AMONG FRUIT SELLERS IN JIGAWA STATE

**Ka'abu Mu'azu**

Department of Physical and Health Education  
Jigawa State College of Education, Gumel, Nigeria  
[kaabmuaz@gmail.com](mailto:kaabmuaz@gmail.com), +234 7030976033

**Umar Muhammad**

Department of Physical and Health Education  
Jigawa State College of Education, Gumel, Nigeria  
[umaishadai@gmail.com](mailto:umaishadai@gmail.com), +234 7039631728

**Usman Abdullahi**

Department of Physical and Health Education  
Jigawa State College of Education, Gumel, Nigeria  
[mainasarausmanabdullahi@gmail.com](mailto:mainasarausmanabdullahi@gmail.com)  
+234 8031380823

**Hamisu Dodo**

Department of Physical and Health Education  
Jigawa State College of Education, Gumel, Nigeria  
[Malam40@gmail.com](mailto:Malam40@gmail.com)  
8069516103

## Abstract

*The study investigated the level of awareness of fruits sellers on the effects of calcium carbide application on fruits. Participants were recruited for the study using accidental sampling processes. The study adopted a descriptive survey design of an ex-post factor type with the use of structured questionnaire in which the fruits sellers were interviewed to determine their knowledge of the health implication of the application of calcium carbide on fruits for human consumption. Almost all the fruit sellers exhibited insufficient health knowledge of the implication of calcium carbide on fruits as revealed in this study. The study recommended the need for creating more awareness among fruit sellers on health effects or dangers of calcium carbide on human health, through health education programmes on the radio, television and other means of communication.*

**Keywords:** Knowledge, Calcium carbide, Fruits, Health effects

## Introduction

Calcium carbide is a very cheap and the most commonly used chemical for ripening fruits like mangoes, bananas, guavas, papaya, apple, melon, and others (Lawaly, 2022). Fruits are highly nutritious that form an important food item in the human diet. Ripening of fruit is a natural way in which the fruit undergoes various chemical changes to gradually become sweet, flavoured, coloured, gets soft and become tasty (Osakue & Okungbowa, 2018). However, in the recent time, this process has been facilitated to meet the growing demand of people, leading to many fruit sellers, marketers and farmers in most developing countries (including Nigeria) to engage in ripening of fruits with chemicals such as calcium carbide (Osakue & Okungbowa, 2018). Calcium Carbide ( $\text{CaC}_2$ ) is primarily used for welding purposes (Adeyemi, Bawa & Muktar, 2018). Its outstanding property reacts with water to produce acetylene gas. It is a chemical compound used in the production of acetylene and calcium cyanamide. Pure  $\text{CaC}_2$  is colorless, but the impure is grey or brown and consists of 80-85% of  $\text{CaC}_2$  (the rest is calcium oxide ( $\text{CaO}$ )) (Chandle, 2014). Calcium carbide can induce ripening within 24 hours (Ismail et al., 2017). Study revealed that administration of calcium carbide for fruit ripening may result in the reduction of some food nutrients (Adeyemi, Bawa & Muktar, 2018), changes only the skin colour, whereas the fruit remains raw inside (Chandle, 2014). Unfortunately, the benefits of fruits in health and disease prevention seem to be threatened due to the artificial ripening of fruits with such substances (Osakue & Okungbowa, 2018). It has been reported that artificial ripening of fruits with calcium carbide exposes consumers to high risk of developing cancer, kidney and heart diseases (Bature, 2018). Earlier, Hossain, Akhtar and Anwar (2015) reported that food commodities are being contaminated with toxic and health hazardous chemicals like calcium carbide, ethylene which are being used for ripening of fruits. Ripening of fruits with carbide has been banned in many of the developed countries (Ogbuagu, Ujowundu & Izunobi, 2016). This situation places a great concern about artificial ripening of fruits in the developing parts of the world including Nigeria, which prompted the need for this study. Moreover, cases related to Kidney, liver and cardiac diseases are more prevalent today than any other period in the past. The study was based on the following research question: Do fruit sellers who apply calcium carbide on fruits have knowledge of its health effects?

In these days artificial ripening seems to be the major process of ripening among fruit sellers. Artificial ripening of fruits with calcium carbide exposes consumers to high risk of developing cancer, kidney and heart diseases (Bature, 2018). Cases related to Kidney, liver and cardiac diseases are more prevalent today than any other period in the past. Earlier, Hossain, Akhtar and Anwar (2015) reported that food commodities are being contaminated with toxic and health hazardous chemicals like calcium carbide, ethylene which are being used for ripening of fruits. Ripening of fruits with carbide has been banned in many of the developed countries (Ogbuagu, Ujowundu & Izunobi, 2016). This situation places a great concern about artificial ripening of fruits in the developing parts of the world including Nigeria, Jigawa state is not exclusive. This is what prompted the need for this study. Moreover, cases related to Kidney, liver and cardiac diseases are more prevalent today than any other period in the past. The study was based on the following research question: Do fruit sellers who apply calcium carbide on fruits have knowledge of its health effects?

Numerous studies discovered changes of nutritional properties of fruits ripened with Calcium carbide and revealed to have caused or lead to serious health hazards to human beings like cancer, liver disease, kidney disease, cardiac disturbances, skin irritation, diarrhea, gastrointestinal irritation with nausea, vomiting, central nervous system depression and

cardiac abnormalities (Lawaly, 2022). Several studies have reported that Calcium carbide has carcinogenic and neurological- disorder properties (Gupta, 2017; Ismail et al., 2017; Hossain, Akhtar & Anwar, 2015). It affects the neurological system, resulting in headache, dizziness, mood disturbances, sleepiness, mental confusion, seizures and can cause memory loss, cerebral edema, kidney failure, liver cirrhosis and heart failure (Osakue & Okungbowa, 2018; Gupta, 2017; Shaon et al., 2016). It reduces oxygen supply to the brain and further induces prolonged hypoxia. It can result in tingling sensation, numbness and peripheral neuropathy. Its usage is not only toxic to consumers, but it is also harmful to those who handle it. If pregnant women consume fruits ripened with carbide, the unborn children could develop abnormalities (Osakue & Okungbowa, 2018; Gupta, 2017). Consumption of fruits such as mango, banana, pawpaw and plantain being artificially ripened with this substance could cause cancer (Bature, 2018).

Earlier, Hossain, Akhtar and Anwar (2015) reported that most of the ripening agents are toxic and their consumption can cause serious health problems, such as heart disease, skin disease, lung failure and kidney failure. In the recent past, Ismail et al. (2017) revealed that among the effects caused by Calcium carbide include: skin irritation, rashes, lung irritation, which can initiate cough and/or shortness of breath. Pulmonary edema with acute shortness of breath may occur with higher exposure to  $\text{CaC}_2$  through inhalation, and repeated exposure can cause bronchitis with coughing, phlegm, and/or shortness of breath (Ismail et al., 2017). Consumption of carbide-ripened fruits is extremely hazardous for health. Consumption of  $\text{CaC}_2$  causes heart disease, skin disease, lung failure, kidney failure, stomach upsets, frequent thirst, irritation in mouth and nose, weakness, vomiting during handling and pulmonary edema, weakness, skin ulcer and heart related other diseases (Shaon et al., 2016). All these effects are caused as a result of  $\text{CaC}_2$  which is mainly use for welding, pharmaceutical and other industrial purposes.

### **Methodology**

Jigawa state comprises of three senatorial districts namely: Jigawa South-West, Jigawa North-East and Jigawa North-West. Jigawa South-West comprises of seven LGAs (Birnin Kudu, Buji, Dutse, Gwaram, Kiyawa, Jahun, Miga). Jigawa North-East consists of eight LGAs (Auyo, Birniwa, Guri, Hadejia, Kaugama, K/Hausa, K/Hausa, K/Kasamma, M/Madori) Jigawa North-West consist of twelve LGAs (Babura, Gagarawa, Garki, Gwiwa, Kazaure, Maigatari, Roni, Ringim, Sule Tankarkar, Taura, Yankwashi, Gumel).

Multi-stage process using purposive, random and accidental sampling techniques were adopted in this study, while engaging the participating markets and fruits sellers. Five (5) markets from each of the three senatorial districts of Jigawa state was selected, making fifteen (15) markets. From each market, ten (10) fruits sellers were drawn to obtain a total number of one hundred and fifty (150) participants. The fruit sellers were interviewed using a designed questionnaire to determine their level of knowledge of the health implication of the application of calcium carbide on fruits for human consumption.

## Results

**Table 1: Demographic indicators of the participants**

	Variable	Frequency	%
<i>Gender</i>	Male	146	100
<i>Age</i>	20- 30 years	47	32.1
	31- 40 years	51	34.9
	41- 50 years	41	28.9
	51-60 above years	14	9.6
<i>Educational status</i>	Non formal school	43	29.4
	Primary	23	15.7
	Secondary	57	39.0
	Tertiary	19	13.0

The table has shown that all the fruit sellers were males. Large number of the fruit sellers representing 37.6 % were between the age of 31 - 40 years, followed by those within the age of 20 to 30 years with 34.9 %. Thirty-six of them representing 24.6% are within the ages of 41 to 50 years, with least of them in the age categories of 51 to above 60 years. Majority of the fruit sellers representing 34.9% had secondary leaving certificate, following by those who acquired non-formal schooling 29.4%, with few of those who had primary leaving certificate (12.3%) and very least of the fruit sellers (9.3%) acquired tertiary certificate.

**Table 2: Influence of age of Fruit sellers on the Knowledge of health effect**

Variable	Age							
	20-30yr		31-40yr		41-50yr		51-60+yr	
	Yes	No	Yes	No	Yes	No	Yes	No
Use something to ripen fruits	33	14	34	17	26	8	11	3
Use of Calcium carbide	36	11	35	16	25	9	9	5
Calcium carbide has health risk	11	36	15	36	8	26	3	11
Consumption of fruits ripened with calcium carbide can cause a heart disease	17	30	18	33	6	28	1	13
Fruits ripened with calcium carbide can cause a kidneyproblem	12	35	14	37	5	29	2	12
Calcium carbide used in ripening fruits can cause high risk for developing cancer	16	31	19	32	7	27	1	13
Consumption of fruits ripened with calcium carbide can cause skin damage	11	36	17	34	9	25	2	12
Fruits ripened with calcium carbide can cause stomach upset	14	33	16	35	11	23	1	13
Fruits ripened with calcium carbide can cause headache, sleeplessness, dizziness, mood disturbances, mental confusion, memory loss, and swelling in the brain	16	31	14	37	5	29	0	14

From the table, it can be deduced that majority of the fruit sellers in Jigawa state utilized calcium carbide to ripe their fruits, regardless of the age categories. Higher frequency and

percentage of the fruit sellers admit that use of calcium carbide in ripening fruits has no health risk across all the age categories. But larger proportion of the fruit sellers from the age of 20 -30 years had the highest frequency and claimed to have revealed that consumption of fruits ripened with calcium carbide would not cause any heart disease, kidney problem, high risk for developing cancer, skin damage, and stomach upset. Also, it would not cause any headache, sleeplessness, dizziness, mood disturbances, mental confusion, memory loss, and swelling in the brain.

The fruit sellers within the age of 31 – 40 years had the second higher frequency, they revealed that consumption of fruits ripened with calcium carbide would not cause any disease. This was followed by those within the age of 41 -50 years, with the least from those within the age of 51 to 60 years and above. Considering the fruit sellers' responses, it can be noted that in all the age categories, fruit sellers had insufficient knowledge about the health implication of calcium carbide on fruit ripening. Similarly, the table revealed no significant influence of age on the knowledge of the health effects of calcium carbide application among fruit sellers.

**Table 3: Influence of Fruit sellers' educational background on Knowledge of the Health effects of Calcium Carbide Application on Fruits**

Variable	Educational Level															
	TER. EDU. n=19 (13.0%)				SEC. EDU. n=57 (39.0%)				PRI. EDU. n=23 (15.7%)				NONF. SCH. n=47 (32.2%)			
	Yes	%	No	%	Yes	%	No	%	Yes	%	No	%	Yes	%	No	%
Use something to ripened fruits	4	2.7	15	10.3	25	17.1	32	21.9	18	12.3	5	3.4	44	30.1	3	2.1
Use of Calcium carbide	3	2.1	16	10.9	34	23.3	17	11.6	21	14.4	2	1.4	41	28.1	6	4.1
Calcium carbide has health risk	15	10.3	4	2.7	18	12.3	39	26.7	1	0.6	22	15.1	2	1.4	45	30.1
Consumption of Fruits ripened with calcium carbide can cause a heart disease	12	8.2	7	4.8	16	10.9	41	28.1	2	1.4	21	14.4	4	2.7	43	29.5
Fruits ripened with calcium carbide can cause a kidney problem	9	6.2	10	6.8	14	9.6	43	29.5	3	2.1	20	13.7	1	0.6	46	31.5
Calcium carbide used in ripening fruits can cause high risk for developing cancer	13	8.9	6	4.1	11	7.5	46	31.5	1	0.6	22	15.1	2	1.3	45	30.8
Consumption of Fruits ripened with calcium carbide can cause skin damage	11	7.5	8	5.5	5	3.4	52	35.6	1	0.6	22	15.1	0	0	47	32.2
Fruits ripened with calcium carbide can cause stomach upset	10	6.8	9	6.2	9	6.2	48	32.9	1	0.6	22	15.1	1	0.6	46	31.5
Fruits ripened with calcium carbide can cause headache, sleeplessness, dizziness, mood disturbances, mental confusion, memory loss, and swelling in the brain	6	4.1	13	8.9	4	2.7	53	36.3	2	1.4	21	14.4	0	0	47	32.2

The majority of the fruit sellers 39.0% had secondary leaving certificate. From the table it can observed that larger number of the fruit sellers that use something to ripe fruits are those with non-formal school education (32.2%), followed by those who had primary leaving certificate (15.7%), secondary education with few from those who attended tertiary level (13.0%).

Majority of those with non-formal schooling (29.4%) claimed that fruit ripen with Calcium carbide has no any health risk, also revealed that consumption of fruits ripened with calcium carbide would not cause any heart disease, kidney problem, high risk for developing cancer, skin damage, and stomach upset. Neither, it would not cause any headache, sleeplessness, dizziness, mood disturbances, mental confusion, memory loss, and swelling in the brain.

The views of those who had primary certificate is following with higher percentage as they responded similar views that fruits ripened with calcium carbide would have no harm on human health and it would not cause any disease. This was followed by those who had secondary leaving certificate in terms of the frequency and per cent. Very few of those from tertiary. The higher the educational level, the higher the knowledge of the health effect as can be seen from the result of the table. This demonstrates that educational level played a role in the knowledge of the health effect of the application of calcium carbide among fruit sellers in Jigawa state. Meaning that fruit sellers with higher educational level had more knowledge on the health effect of calcium carbide application on fruits.

**Table 3: Influence of Fruit sellers' educational background on Knowledge of the Health effects of Calcium Carbide Application on Fruits**

**Table 4: Fruits sellers' Knowledge assessment across all the Markets in Jigawa State**

Variable	Yes	%	No	%
Use something to ripened fruits	89	60.9	57	39.1
Use of Calcium carbide	80		66	45.2
Calcium carbide has health risk	47	32.2	99	67.8
Consumption Fruits ripened with calcium carbide can cause a heart disease	60	41.1	86	58.9
Fruits ripened with calcium carbide can cause a kidney problem	48	32.8	98	67.1
Calcium carbide used in ripening fruits can cause high risk for developing cancer	42	28.7	104	71.2
Consumption of Fruits ripened with calcium carbide can cause skin damage	40	27.3	106	72.6
Fruits ripened with calcium carbide can cause stomach upset	54	36.9	92	63.1
Fruits ripened with calcium carbide can cause headache, sleeplessness, dizziness, mood disturbances, mental confusion, memory loss, and swelling in the brain	41	28.1	105	71.9

It can be seen that from this table, majority of the fruit sellers (60.9%) in Jigawa state use something to ripe their fruits. Eighty of them (54.8%) use calcium carbide in ripening fruits. Calcium carbide has no any health risk as claimed by 67.8% of the fruit sellers. Handful number of them (58.9%) responded that consumption of fruits ripened with calcium carbide can not cause any heart disease. Ninety-eight of them (67.1%) claimed that fruits ripened with calcium carbide would not cause a kidney problem. Majority (71.2%) of the fruit sellers responded that calcium carbide used in ripening fruits would not cause high risk for developing cancer. Also, consumption of fruits ripened with calcium carbide cannot cause skin damage as revealed by 106(72.6%) fruit sellers. Similarly, ninety-two (92) of the fruit sellers (63.1%) had the believed that fruits ripened with calcium carbide would not cause any stomach upset. Finally, one hundred and five (105) fruit sellers (71.9%) reported that there would be no any headache, sleeplessness, dizziness, mood disturbances, mental confusion,

memory loss, and swelling in the brain as a result of the consumption of fruits ripened with calcium carbide. This implied that the fruit sellers in Jigawa state, had an insufficient knowledge of the health effect of the application of calcium carbide on fruits.

### **Discussions**

Findings of this study have shown that the fruit sellers had poor knowledge of the effect of Calcium carbide on human health consumption. In the recent past, Lawaly (2022) revealed that fruits ripened with Calcium carbide may cause or lead to serious health hazards to human beings like cancer, liver disease, kidney disease, cardiac disturbances, skin irritation, diarrhea, gastrointestinal irritation with nausea, vomiting, central nervous system depression and cardiac abnormalities.

Several other studies have reported that Calcium carbide has carcinogenic and neurological-disorder properties (Gupta, 2017; Ismail, Rasdi, Mangala & Adidin. 2017; Hossain, Akhtar & Anwar, 2015). It affects the neurological system, resulting in headache, dizziness, mood disturbances, sleepiness, mental confusion, seizures and can cause memory loss, cerebral edema, kidney failure, liver cirrhosis and heart failure (Osakue & Okungbowa, 2018; Gupta, 2017; Shaon et al., 2016). It reduces oxygen supply to the brain and further induces prolonged hypoxia. It can result in tingling sensation, numbness and peripheral neuropathy. Its usage is not only toxic to consumers, but it is also harmful to those who handle it. If pregnant women consume fruits ripened with carbide, the unborn children could develop abnormalities (Osakue & Okungbowa, 2018; Gupta, 2017). Consumption of fruits such as mango, banana, pawpaw and plantain being artificially ripened with this substance could cause cancer (Bature, 2018). Earlier, Hossain, Akhtar and Anwar (2015) reported that most of the ripening agents are toxic and their consumption can cause serious health problems, such as heart disease, skin disease, lung failure and kidney failure. In the recent past, Ismail et al. (2017) revealed that among the effects caused by Calcium carbide include: skin irritation, rashes, lung irritation, which can initiate cough and/or shortness of breath. Pulmonary edema with acute shortness of breath may occur with higher exposure to  $\text{CaC}_2$  through inhalation, and repeated exposure can cause bronchitis with coughing, phlegm, and/or shortness of breath (Ismail et al., 2017). Consumption of carbide-ripened fruits is extremely hazardous for health. Consumption of  $\text{CaC}_2$  causes heart disease, skin disease, lung failure, kidney failure, stomach upsets, frequent thirst, irritation in mouth and nose, weakness, vomiting during handling and pulmonary edema, weakness, skin ulcer and heart related other diseases (Shaon et al., 2016). All these effects are caused as a result of  $\text{CaC}_2$  which is mainly use for welding, pharmaceutical and other industrial purposes.

### **Conclusion**

From the result of this study, fruit sellers had poor or insufficient knowledge of the possible health effects of fruits ripened with Calcium Carbide as a risk factor in the causation of several human diseases.

### **Recommendations**

The study recommends the following:

- There is need to create more awareness among fruit sellers on the dangers of the use of calcium carbide as an artificial ripening technique on human health, through health education programmes on the radio, television and other means of communication.
- Fruit sellers should exercise patience for fruits to be sold to ripe naturally before taking them to the market.



- There is need for the enactment of laws that inhibit the use of calcium carbide for repining of fruits.
- There is need to establish regulatory agencies that should, henceforth, oversee the production and sales of fruits.

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