

Awareness of Toxic and Harmful School Plants and their Prevention and Protection for Learners against Plant-Causing Emergencies

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Abstracts: The school greening program supports the inculcation among learners with the love of nature since it cultivates among them the significance of plants in making the learning space beautiful and healthy. However, people cannot just bring any beautiful ornamental plants as they please especially to a school campus. Plants ideally possess defense mechanisms to protect themselves from harm. Hence, they develop thorns, spikes, and scents to ward off any potential predators. A piece of knowledge about this plant defense mechanism as well as plants' toxicity should be instilled among the adults in the learning space, particularly the teachers. Thus, this paper intends to ascertain the level of awareness of public school teachers on toxic and harmful plants commonly found in the classroom or school premises and determine the level of prevention and protection for learners against plant-causing emergencies. Results reveal that the teachers' awareness particularly on making the learning space safe may have something to do with first aid application in case of emergencies and protecting children. The more the teachers aim to provide a wholesome and safe space for the learners, the more they try to learn and apply first aid as their way of protecting their learners. It is recommended that the school should provide first aid kits with antihistamines and teachers should be provided by the concerned agencies list of plants that may potentially be toxic or harmful to the schoolchildren. Furthermore, school gardening activities must be done with great precautions.

Keywords: Plant-causing emergencies, Prevention and protection, Teacher's awareness, Toxic and harmful plants.

1. INTRODUCTION

To bring beauty into the school environment, teachers bring plants as indoor decorations to provide greenery in the learning space. Plants generally form the critical base of food chains in nearly all ecosystems. Through photosynthesis, plants harvest the energy of the sun, providing both food and habitat for other organisms [1]. School children are taught about this benefit of plants and are encouraged to plant, grow, and take care of plants for they are important parts of human lives and the ecosystem in general. However, young as they are they also have to be taught that not all plants are safe.

Plants can contribute to the psychological well-being and development of children. It has even been proven that plants in the classroom reduce: student anxiety, sickness, and absenteeism [2]. There are, however, plant species though with healing and economic values that are categorized to contain harmful or toxic effects to those who have direct or indirect contact with them. Familiarity and awareness with these plants and their harmful effects on people is crucial especially when the premises where these plants grow have children [3].

In the Philippines, the Department of Education implemented the School Inside Garden Program which focuses primarily on establishing inside gardens featuring mostly indigenous and endemic trees and flowering plants making campuses nationwide green and colorful. Two of the program aims are to promote the creation of nurseries for indigenous and endemic trees in specific campuses that will serve as a laboratory for learners and highlight the importance of schools and their role in the efforts to rehabilitate a heavily challenged natural environment, and their initiatives toward a sustainable National Greening Program [4].

The school inside garden program meant well for it justifies the DepEd's core value "Makakalikasan" which suggests being a nature-lover. Yet, the program implementers such as the school heads as well as the teachers should also be aware that some types of plants can cause harm and worse death among those curious and unaware. Some plants may look harmless enough, but they can harbor some of the deadliest poisons known. From the death of Socrates by poison hemlock to the accidental ingestion of deadly nightshade by children, poisonous plants have been responsible for human deaths throughout history [5].

The literature presents several reported cases of toxic plants. It has been “estimated that 3.5% of all poisonings in the United States are due to plants.” Most of these plant poisonings occur in children who are of school age or younger [6]. The University of Nebraska stated plants are the third most common cause of poisoning among children in the United States after medicine and household chemicals [6]. According to the American Association of Poison Control Centers database, analyzed for the period 2000–2008, 3.4% of all poisoning in the United States was due to plants and nearly 70% of victims were children under the age of six [7]. Moreover, the presence of the poisonous and allergenic plant species was observed in 8 primary schools and 6 preschools in Novi Sad, Serbia [8]. The most common toxic exposure reason was unintentional (98%), and the majority (92.4%) occurred at the patient's home. Ingestions (58.3%) and dermal exposures (34.3%) accounted for most cases. Cactus (27.5%), oleander (12.5%), Lantana (5.7%), and Bougainvillea (3.8%) were most commonly involved. Symptoms developed in 47.1% of patients and were more likely to occur following Datura (66.7%), and Morning Glory or Milkweed (25% each) exposures [9]. All these plant exposures reported to poison control centers were typically unintentional ingestions [8].

In Asia, many cases of poisoning are due to ingestion of *Jatropha curcas* or commonly called Tuba-tuba or Tubing-bakod. Four cases of *Jatropha* poisoning have been reported from different parts of India. Children are particularly susceptible to it. In the Philippines, *Jatropha* poisoning is one of the 10 leading causes of poisoning in children in the Philippines. Every year children are admitted at Region 1 Medical Center, one of the biggest referral centers in the north of Luzon, due to acute Tuba-tuba ingestion or what is locally known as “tumba” ingestion [9].

Jatropha curcas or Tuba-tuba, *Dieffenbachia picta* or Dumb Cane, *Dracaena trifasciata*, or Snake Plant, *Cycadophyta* or Cycads are just a few examples of plants found in classroom and school premises. They all contain heavy to mild toxins that may harm those who are curious. Though most children who are reported to have been poisoned by some of these plants are already out of harm's way, healthcare providers as well as teachers must recognize, assess, and initiate appropriate management to minimize the serious consequences that could endanger the lives of these children. In addition, [10] recommends that information dissemination and education focused on pupils, parents, and teachers at elementary schools in endemic areas where these identified poisonous plants grow should be strengthened. A study urges the public and clinicians to be educated about plant poisoning to improve the prevention and treatment of plant poisoning [11]. A study pondered whether or not the school landscaping considers the appropriateness of the use of certain ornamental species in arranging the school's greenery [8].

Because of these forgoing accounts, the researcher intends to determine the level of awareness of public-school teachers as the loco parentis or second parents of schoolchildren about the toxic and harmful plants and the level of children's protection against these plant species. The data that this study gathered can be made as a basis to take into consideration the appropriateness of plants to beautify schools in the implementation of the school gardening program or any other school beautification and greening program.

2. MATERIALS AND METHODS

2.1. Objectives of the Study

The main intention of this paper is to ascertain the level of awareness of public school teachers on toxic and harmful plants commonly found in the classroom or school premises. It also aims to determine the teachers' level of prevention and protection for learners against plant-causing emergencies. Specifically, the study sought to address the following objectives:

2.1.1. Determine the profile of the teachers in terms of no. of first aid-related training attended and the number of ornamental plants owned at home;

2.1.2. Ascertain the teachers' level of awareness of toxic and harmful plants;

2.1.3. Gauge the teachers' level of prevention and protection for children against plant-causing emergencies; and

2.1.4. Establish whether there is a significant relationship between the teachers' level of awareness of harmful plants and the level of prevention and protection for learners against plant-causing emergencies.

2.2. Study Area and Study Design

The study involved randomly selected rural public school teachers in the Esperanza District 2 of Esperanza, Agusan del Sur, Philippines. These teachers are assigned to schools having indoor and outdoor ornamental plants displayed on the premises and inside the classrooms. The study used a quantitative research design. In particular, the descriptive-correlational method was applied. It is descriptive because it assesses the teachers' level of awareness of toxic and harmful plants and their level of prevention and protection for learners against plant-causing emergencies and it is also correlational since it involved testing whether the relationship between the two mentioned variables exists.

2.3. Procedures

Data were collected using the survey questionnaire designed by the researcher. It underwent content and construct validation. There were 32 teachers who were involved in the try-out test of the instrument. All items were retained since the pilot test result came out with Cronbach's Alpha value of 0.94.

2.4. Data Analysis

The statistical tools used to facilitate the interpretation of the data collected were the Frequency Counts and Percentages, Weighted Mean, and Pearson Product Moment Correlation. Frequency counts are used to identify the profile of the participants. Weighted Mean, on the other hand, is used to get the general perception of the participants regarding their level of awareness of toxic and harmful plants and the level of prevention and protection for learners against plant-causing emergencies. Pearson *r* is employed to establish a correlation between the two mentioned variables.

3. RESULTS AND DISCUSSIONS

3.1. Profile of the Participants

3.1.1. First Aid Related Training Attended by Teachers

As presented in the figure above, out of 50 teachers, 40 or 80% of them have not or have only attended 0-2 first aid-related training and only 2 or 4% have participated in 5 and beyond pieces of training. This data suggests that the majority of the teachers need to upgrade themselves to first aid and other related training.

Table 1. First-Aid-Related Training Attended by Teachers (n=50).

Variables		Frequency	Percentage
No. of Training	0 - 2	40	80
	3 - 4	8	16
	5 and beyond	2	4

The results are corroborated in the study entitled "Awareness, Attitudes, and Practices of First Aid among School Teachers in Mangalore, South India" wherein they found that the competency level among teachers in the locale to administer first aid is inadequate [12]. They then proposed that measures need to be taken at schools to ensure the initiation of first aid training followed by periodic training for teachers in first aid. Furthermore, in the study entitled "The Effects of Basic First Aid Education on Teachers' Knowledge Level: A Pilot Study," teachers, who are always with children, need basic first aid education so that they can do first aid in case of an accident or injury [13]. First aid practices are very important because, with simple interventions, it can be possible to prevent death or further injuries.

3.1.2. Indoor Ornamental Plants Owned by the Teachers

As reflected in the figure above, 38 or 76% of the teachers owned many ornamental plants at home; and only 4 or 8% of them have 1 or no plants at all at home. This data entails that many teachers are interested in growing gardens or indoor plants in their own homes which consequently shows that they may have brought some or many plants into their respective workstations since classrooms are considered their second abodes.

Table 2. Number of Indoor Ornamental Plants Owned by the Teachers (N=50).

Variables	Frequency	Percentage	
No. of Plants Owned	I have plenty of plants at home.	38	76
	I have a few plants at home.	8	16
	I have 1 or no plants at home	4	8

Although studies entitled “Do indoor plants contribute to the aeromycota in city buildings?” found that neither the number of plants nor the species of plant used had an influence on spore loads; however, variations of those two variables offer the potential for further studies [14]. However, a study entitled “Allergic Sensitization to Ornamental Plants in Patients with Allergic Rhinitis and Asthma” stated that ornamental plants can lead to immediate-type sensitization and even asthma and rhinitis symptoms in some cases. They found that sensitivity to ornamental plants was significantly higher in atopic subjects and patients with allergic rhinitis, food allergy, and indoor ornamental plant exposure [15].

3.1.3. Plants Available in the Classroom

As seen in the figure below, there are toxic and harmful ornamental plants displayed or planted in the classrooms and school premises; 45 of them are Dumb Canes, Chili, Daphne, and Physic nuts. The data show that teachers may have brought these toxic and harmful ornamental plants into school grounds or classrooms unaware that these plants may harm their learners. Furthermore, this data shows that teachers practiced school greenery but may have unknowingly displayed plants that instead of beautifying the school, may cause ailment to school occupants, particularly children.

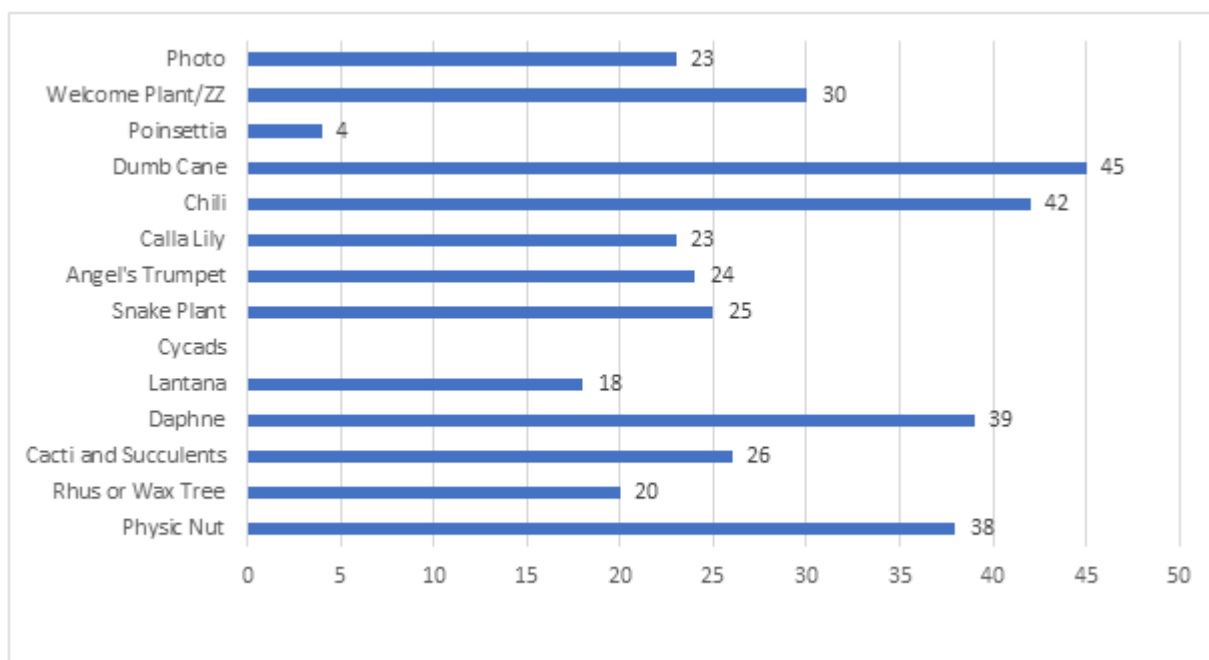


Figure 1. Plants Available in the Classroom.

There are indeed common ornamental plants that are harmful to children and which are displayed or planted on school grounds. There were cases reported that wax plants or *Hoya carnosa* can cause occupational allergic contact dermatitis [16]. Every year children are admitted at Region 1 Medical Center, one of the biggest referral centers in the north of Luzon, Philippines due to acute Tuba-tuba ingestion or what is locally known as “tumba” ingestion [10]. Moreover, there was reported Chili poisoning that killed a two-year-old in the southern Californian City of Apple Valley. British Columbia Drug and Poison Information Centre also considered *Daphne laureola* or common “Daphne” as toxic to children because its berries and all of its parts contain a compound that has irritant and blistering properties. Any contact with its sap may result in irritation, redness, swelling, and blisters. Aside from the toxicity and harm of some of the ornamental plants, there are health risks in the presence of natural indoor plants due to the pathogenic fungal/bacterial components released from potting soils [18].

3.2. Level of Awareness of Harmful Plants in School

As browsed in the table, Indicators A5 and B5 garnered the lowest weighted mean and are described as barely aware or unaware. This result illustrates that public school teachers can barely identify the areas in the school where harmful plants may be located, and they are barely aware that some plants can cause nausea and vomiting in children. This situation calls for wider dissemination of information regarding plants and greeneries in schools. This corroborates the call to action where they urge the public to be educated about plant toxicity and poisoning to improve prevention and treatment [11]. In addition, it is recommended that information dissemination and education focused on pupils, parents, and teachers at elementary schools in endemic areas where these identified poisonous plants grow should be strengthened [10].

Table 3. Mean Distribution on the Teachers' Level of Awareness of Harmful Plants in School.

Indicators	Mean	Verbal Description
A. Knowledge of Harmful Plants		
1. I have knowledge about harmful plants which may be present in school or classroom	1.92	Aware
2. I acknowledge that plants in schools or classrooms are harmful to students when ingested.	2.20	Aware
3. I acknowledge that there are plants in schools or classrooms that can cause allergic reactions in children as well as adults.	2.04	Aware
4. I acknowledge that there are plants in schools or classrooms that can prick, poke, or hurt children as well as adults.	2.20	Aware
5. I can identify the areas in the school where harmful plants may be located.	1.52	Barely or Unaware
Total	1.98	Aware
B. Knowledge of Plants Harm to Children/Adults		
1. I can tell the signs if a child has negative reactions to plants.	1.44	Barely or Unaware
2. I know that burning some plants can cause lung irritation and other respiratory issues.	1.40	Barely or Unaware
3. I know that direct contact with some plants may cause harm to children.	1.88	Aware
4. I know that indirect contact with plants can still bring harm to children (touching tools, animals, or clothing with Urushiol on them).	1.36	Barely or Unaware
5. I know that some plants can cause nausea and vomiting in children.	1.28	Barely or Unaware
Total	1.47	Barely or Unaware

Note: Ranges: 1.00-1.66 (Barely or Unaware); 1.67-2.33 (Aware); 2.34-3.00 (Highly Aware).

3.3. Level of Prevention and Protection Against Plant-Causing Emergencies

As gleaned in the table, indicators A5 and B3 got the lowest weighted mean and are described as not or barely preventive or protective. The data suggests that the teachers may have not included in their lesson topics about harmful plants and plants that should be avoided by children. Also, they do not have in their keeping antihistamines which are necessary when children will have allergy attacks. The data entails that teachers should be more cautious

about the harmful effects of toxic plants, and they should be more protective of their learners as they are considered second parents. Raising Children Network (Australia) reminds adults to keep the learning space safe and healthy for the children [19].

Table 4. Mean Distribution on the Teachers' Level of Prevention and Protection Against Plant-causing Emergencies.

Indicators	Mean	Verbal Description
A. Making Classroom/School Safe for Children		
1. I supervise children to avoid danger in the garden or anywhere.	2.32	Preventive/Protective
2. I warn children about poisonous and dangerous plants which are in the classroom or school premises	1.96	Preventive/Protective
3. I fence off or remove any suspected harmful plants	1.88	Preventive/Protective
4. I display only child-friendly plants in the classroom on the school premises	2.32	Preventive/Protective
5. I include in the lessons topics about harmful plants and plants that should be avoided by children	1.48	Barely or Not Preventive/Protective
Total	1.99	Preventive/Protective
B. Protecting Children from Harmful Plants		
1. If the child is exposed to a poisonous plant, I can apply my knowledge of first aid (rinsing skin with rubbing alcohol, poison plant wash, or degreasing soap; scrubbing under nails with a brush; applying wet compresses, calamine lotion, or hydrocortisone cream the to skin; using an antihistamine)	2.36	Highly Preventive/Protective
2. When children do gardening activities, I require them to use materials that can protect themselves from harmful plants (gloves and boots)	2.56	Highly Preventive nor Protective
3. I keep antihistamines in the first aid box.	2.12	Preventive/Protective
4. I instruct children to report cases that involve harmful plants and other classroom/school emergencies	2.56	Highly Preventive/Protective
5. In severe cases, I know whom to ask help from.	2.52	Highly Preventive/ Protective
Total	2.42	Highly Preventive/Protective

Note: Ranges: 1.00-1.66 (Barely or Not Preventive/Protective); 1.67-2.33 (Preventive/Protective); 2.34-3.00 (Highly Preventive/Protective)

3.4. Correlation Analysis between the Level of Awareness of Toxic and Harmful Plants and the Level of Prevention and Protection against Plant-Causing Emergencies

As shown in the table, Indicators Making Classroom/School Safe for Children under the level of Awareness and Applying First Aid and Protecting Children from Harmful Plants under the level of prevention and protection against plant-causing emergencies got a p-value of 0.05 which is equal to 0.05 set for analysis. Thus, there is a significant relationship between the teachers' level of awareness of toxic and harmful plants in terms of making classrooms or schools safe for children and the level of prevention and protection against plant-causing emergencies in terms of applying first aid and protecting children from harmful plants.

This data reveals that making the learning space safe may have something to do with first aid application in case of emergencies and protecting children from harm. The more the teachers aim to provide a wholesome and safe space for the learners, the more they try to learn and apply first aid as their way of protecting their learners. As second parents to school children, teachers aside of course from following their mandates, assume the role of loco parentis and take on the obligation of the parent or guardian to take care of the child. This means that a teacher is responsible for protecting the child and acting in the best interest of the child [20].

Table 5. Correlation Analysis between the Level of Awareness of Toxic and Harmful Plants and the Level of Prevention and Protection against Plant-Causing Emergencies.

Variable 1	Variable 2	R-value	P-value	Remarks
Level of awareness of toxic and harmful plants	Level of prevention and protection against plant-causing emergencies			
• Knowledge of Harmful Plants	• Knowledge of Plants Harm to Children	0.185	0.375	Not Significant
	• Applying First and Protecting Children from Harmful Plants	0.185	0.376	Not Significant
• Making Classroom/ School Safe for Children	• Knowledge of Plants Harm to Children	-0.045	0.830	Not Significant
	• Applying First and Protecting Children from Harmful Plants	0.387	0.050	Significant

Note: ** Correlation is Significant at the 0.05 level (2-Tailed).

4. CONCLUSIONS AND RECOMMENDATIONS

School is a mini society where learners are educated to become responsible members of the community. Hence, it is essential for this learning space to be safe and healthy for its main occupants-the learners. But with the intention to make the school grounds beautiful and pleasing to the eyes, school managers and teachers tend to use, display, and grow ornamental plants that are unknowingly toxic and harmful to children who may come in contact with these plants or to children who are curious enough to ingest them. Among these plants found in the school premises are dumb canes, chilies, Daphne, and Physic nut. This is concerning since many of the teachers have inadequate first-aid-related training which entails that during plant-causing emergencies such as allergies and asthma attacks, thorn-pricking situations, and plant poisoning, they may not be much help in giving immediate medical attention. It is also alarming to note that many public school teachers acknowledge the presence of toxic and harmful plants in the school premises, however, they can barely identify the areas in the school where they may be located, and they are barely aware that some of these plants can cause nausea and vomiting in children. Furthermore, these teachers have not included in their lesson topics about harmful plants and plants that should be avoided by children which are essential for children to be also aware so they themselves will avoid such plants. Also, teachers do not have in their keeping antihistamines which are necessary when children have allergy attacks. Although the majority of the indicators under the level of awareness of toxic and harmful plants do not correlate with the level of prevention and protection against plant-causing emergencies, this still calls for further study to include those essential variables which may prove otherwise. The teachers' awareness particularly on making the learning space safe may have something to do with first aid application in case of emergencies and protecting children from harm as their way of prevention and protection against plant-causing emergencies. The more the teachers aim to provide a wholesome and safe space for the learners, the more they try to learn and apply first aid as their way of protecting their learners. To increase the level of awareness, level of prevention, and protection against plant-causing emergencies, school managers, as well as teachers, should be provided with the list of toxic and harmful plants, and they should be given adequate training on first aid including response on plant-causing emergencies and first aid kits with antihistamines, and they have to be more cautious for their learners when doing gardening activities.

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