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Management of German cockroach (Blatella germanica) using mechanical methods (Vacuum cleaner)

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Keywords:**German cockroach, *Blatella germanica,*** Vacuum pump, sticky traps, non-chemical control.

Abstract: The German cockroach the common indoor specie is a potential vector of gastro intestinal infectious microorganisms andcan cause allergy and asthma in humans. In cockroach control programs the non availability of the water, food, dark and shady areas if managed, can reduce their population build up. The present study dealt with determining the effectiveness of mechanical control through the use of vacuum pump in comparison to the chemical control through----------. Sticky traps (Anish insect glue trap, Glue pad plastic yellow sticky trap) were used at regular intervals to monitor the pest population recorded at weekly intervals. Percentage frequency of occurrence was more in trash bins without polybag lining or lids,unwashed utensils left overnight in kitchen with spilled food debris, high humidity places beneath sink and gas stove. A positive correlation was established between the utilization of the vacuum pump at the cockroach hiding and breeding sites twice in a week were found almost equally effective as compared to the chemical control

Introduction:

Infestation of American or German cockroach (Periplaneta *americana* or *Blattella germanica* belonging to the Order - Blattodea and Family - Ectobiidae), is very common under household condition in India. Primarily the pest occupy specific niches viz. Kitchen, wooden drawers, wardrobes, washrooms, sewerage pipe, manhole etc. Poor sanitation conditions leaving the junk food in the kitchen, collecting of utensils, uncovered waste basket, where identified as harboring sites.

Pest monitoring and preventing the population build-up utilizing the integrated pest management approaches including chemical treatments were evaluated. Present studies were conducted by a group of students at their residential premises and by

volunteering for and acting as the Cockroach control services provider in their neighborhood.

In order to effectively utilize this time spent by the students at their home and to foster research aptitudes as well learn the basic technique of experimentation, tabulation, data analysis and Research article writing. The pandemic situation which forced the student to remain confined to their home and away from campus from 22ndMarch till 22ndNovember 2020 was utilized for this study. The prime focus of present investigation remained to train the students for commercial pest control approaches for household pests as service provider.

The Cockroach menace is a common problem in almost all households which are unable to maintain proper hygienic conditions in kitchen, bathroom or wardrobe and thus harbor high pest infestation. The problem is further accentuated due to the lack of awareness among public or about the possible harmful effects menace created by these Cockroaches.

People are not aware of in general about the adverse effects of cockroaches or overlook the households neither involve the commercial pest control service providers. Most of the families are utilizing commercial products available in the market and have adopted to use these products without much scientific techniques and to get an immediate knock down effect of cockroaches.

In the present studies comparison was made between the utilization of vacuum pump, gel or bait application, use of organophosphates and pyrethroids recommended by the State Agricultural. Effectiveness of IPM approach in comparison to the traditional methods was also evaluated.

The German cockroach is the most common indoor specie and it is a potential vector of a number of human gastro intestinal infectious organisms. In addition the Cockroaches cause household allergy and asthma (Anandan C, Nurmatov U-2010).

In cockroach control programs the availability of the water, food, dark and shady areas if managed, can reduce their population build up (Reirson, D. A and M.K – Rust 1977)

Cockroach management through integrated approach has minimum disruptive effect on environment it and can bear a direct relationship between sanitation, level of infestation and its effectiveness. The present study dealt with determining the effectiveness of mechanical control through the use of vacuum pump in an integrated approach and it's comparison with the chemical control.

Materials and methods:

Sticky traps (Anish insect glue trap, Glue pad plastic yellow sticky trap) were used at regular intervals to monitor the pest population recorded at weekly intervals. In the present study 5 residential units were monitored for cockroach infestation and subsequent management utilizing the vacuum pump its effectiveness was compared to the chemical treatment. Cockroach counts were recorded at weekly intervals and the infestation rate was calculated.

To evaluate the effectiveness the residents were also sensitized about the importance of sanitation and exclusion for the Cockroach control. The face-to-face interaction was found to be effective introducing the subject to the residents of the house and techniques to reduce basic inoculums by removing food debris ; using plastic bag liner in that trash containers; using the trash containers with lid and avoiding dampness or leaking taps was emphasized in sensitizing the resident involved in the present studies.

Materials and Methods

Thirty households were chosen for the present study and face to face interaction was done to collect the basic information their house was visited for the proper identification of the pest harboring sites. The treatments where further subdivided into five households per participant students. The initial pest population assessment was done at the harboring sites using sticky traps and is mentioned in **Table1.**

After treatment enlisted in Table 2, the visits were conducted every week and pest infestation was monitored and data recorded from these households. Further, for the adoption of Cockroach IPM approach which was hardly being followed earlier the effectiveness of control approach was further shared with the families so as to educate them as seeing is believing the families learn the technique with lot of interest. The reports are being presented here.

Initial survey was done in the residential apartment of the student themselves and they were asked to select at least five more Apartments or houses for carrying out the pest control program over there. The selection of the five families was based upon the infestation of cockroaches in total six students carried out this study 30 households were involved.The program was carried over for ----months.

Results

The German cockroach *(Blattella germanica)* as compared to the American cockroach (Periplaneta americana) indicated by the initial survey data collected from 25 units locator games located in 5 different States

Table 1. **Percentage frequency of hygienic and unhygienic conditions at cockroach infested houses**

S.No.	Factors related to the availability of food and water	Cockroach colonization places	Frequency	Percentage
1	Do you use vacuum pump for cleaning	Kitchen	30	40.00%
2	Do you remove spider webs or cockroach hiding with broom periodically	Wardrobe	9	12.00%
3	Are you using plastic bag lining in trash bins	No	11	14.67%
4	Does your trash bins container are with/without lids	With lids	15	20.00%
5	After dinner do you leave the dishes in the sink overnight	No	6	8.00%
6	Number of high humidity place in the kitchen	5	10	13.33%
7	Hiding places in the kitchen for cockroaches	Cupboard	23	30.67%
8	Cardboard or other paper boxes in the kitchen	Other boxes in the kitchen	6	8.00%
9	Do you save the paper bags and other carry bags in the kitchen	Yes	5	6.67%

Table 2. Reduction in in the German cockroach population infestation at weekly intervals utilizing vacuuming at infested houses

Factors related to the availability of food and water Cockroach colonization places Percentage frequency of unsatisfactory places

Use vacuum pump using plastic bag lining in trash bins, trash in bins without lids, unwashed utensils left overnight in kitchen with food debris is on the overnight, number of high humidity places.

Table 2

Reduction in in the population infestation at weekly intervals utilizing vacuuming every week:

Tabulation:(Using Vacuum pump) 1st- 5th weeks
Location No: 1 (House No 1)
Date: 28 Sept- 3rd October 2020

Week 1	Adult (Cockroaches)		Nymph (Cockroaches)	Location			
				cupboard	kitchen	Storeroom	washroom
Day 1	26	49	30	27	13	05	
Day 2	23	37	39	07	02	18	
Day 3	42	19	26	03	14	18	
Day 4	17	21	07	06	12	09	
Day 5	23	16	13	12	10	04	
Day 6	16	03	07	09	06	03	

Total: Adult: 153

Nymph: 145

Location: 2 (House no 2)

Date: 05th – 10th October 2020

Week 2	Adult (Cockroaches)		Nymph (Cockroaches)	Location			
				cupboard	kitchen	Storeroom	washroom
Day 1	13	27	19	11	03	07	
Day 2	09	16	10	04	07	04	
Day 3	17	32	07	10	02	05	
Day 4	14	10	20	08	09	12	
Day 5	06	19	04	03	15	13	
Day 6	02	13	03	12	0	0	

Total: Adult: 61

Nymph: 145

Location: 3 (House no 3)

Date: 12th –17th October 2020

Week 3	Adult (Cockroaches)	Nymph (Cockroaches)	Location			
			cupboard	kitchen	Storeroom	washroom
Day 1	07	16	03	07	09	04
Day 2	03	23	20	0	0	03
Day 3	0	0	0	0	0	0
Day 4	12	04	0	10	04	02
Day 5	01	0	0	01	0	0
Day 6	07	03	0	0	10	0

Total: Adult: 30

Nymph: 43

Location: 4 (House no 4)

Date: 19th –24th October 2020

Week 4	Adult (Cockroaches)	Nymph (Cockroaches)	Location			
			cupboard	kitchen	Storeroom	washroom
Day 1	03	12	10	03	0	0
Day 2	0	03	02	0	01	0
Day 3	0	0	0	0	0	01
Day 4	07	0	03	02	02	0
Day 5	0	0	0	0	0	0
Day 6	0	02	01	0	0	02

Total: Adult: 10

Nymph: 17

lLocation: 5 (House no 5)

Date: 26th –31th October 2020

Week 4	Adult (Cockroaches)	Nymph (Cockroaches)	Location			
			cupboard	kitchen	Storeroom	washroom
Day 1	03	0	03	0	0	0
Day 2	0	0	0	0	0	0
Day 3	01	0	0	0	01	0
Day 4	0	0	0	0	0	0
Day 5	0	06	0	04	02	0
Day 6	02	02	0	0	04	0

Total: Adult: 06

Nymph: 08

Discussion

The initial survey indicated that there was a significant positive relationship between the poor sanitation, uncleanliness and the initial level of cockroach infestation. Bathrooms where located in all the houses inside the housing unit and also harbored cockroaches in the present studies the effect of unwashed dishes and leaving leftover food without cleaning the kitchen overnight etc. indicated a higher infestation rate by (20-25 %). (Gold, R.E-1995)have also reported a positive correlation between and unhygienic conditions and control efficiency.

Highest population courts were observed in insanitary conditions near the washing sink in the kitchen.

The lower site of gas stove including knobs were also the harboring places.

The kitchen wardrobe, the undisturbed utensils and containers were the breeding grounds,

Utilization of vacuum pump once in a week was equally effective as compared to twice a week in reducing the infestation

Educating the residents about the places where Cockroaches hide or breed and seeking their cooperation or involvement proved to be equally effective in reducing the subsequent infestation as well it improved the attitude towards sanitation.

Conclusion

A positive correlation was established between the utilization of the vacuum pump at the cockroach hiding and breeding sites twice in a week were found almost equally effective as compared to the chemical control

The first inspection done indicated 45 percentage to 60 percentage has cockroach load on a higher scale as was judged following (Owens, J.M and G.W Bennett, 1982). Treatments followed after initial assessment of the population and were as under:

The Chemicals available in the local market are mentioned as below:

The pest population was monitored by each student volunteer after visiting the five households every week. Monitoring was done based on sticky traps used and on visual observations.

Kitchen cabinet, bathroom, drain pipes, or the area near to these outlets were regularly monitored sticky traps at this sides were placed to monitor the Cockroach infestation. Follow up visits where conducted at every week and population of pest recorded. The pest infestation was observed initially at different locations in the kitchen inside the near to the drain pipe of the wash sink near to the entry or exist points in the kitchen cabinet near to the gas stove and near to the washroom drain pipe patients was examined and number of cockroaches on the sticky traps were recorded after every week The data reported by the subgroups is as under:

Theoretical Cockroach Trap Worksheet:
Cockroach species: Americana
Date installed: 28th September
Date removed: 03rd October 2020-11-02
Trap Night: 6 days
Location= House no: 1

Grand Total: 109, Total: Trap/Night: 12.1

Trap nos.	Location	Total cockroach captured
1	Beside fridge, against wall, beside trash can	20
2	Pantry self, against back wall	21
3	Upper cupboard	12
4	Kitchen	06
5	Storeroom	09
6	Garage	35
7	Washroom	06
8	Under and behind gas stove	26
9	Dustbin area	07

Theoretical Cockroach Trap Worksheet:
Cockroach species: Americana
Date installed: 05th October 2020
Date removed: 10thOctober 2020
Trap Night: 6 days
Location= House no: 2

Grand Total: 115, Total: Trap/Night: 12.7

Trap nos.	Location	Total cockroach captured
1	Beside fridge, against wall, beside trash can	15
2	Pantry self, against back wall	20
3	Upper cupboard	06
4	Kitchen	10
5	Storeroom	11
6	Garage	30
7	Washroom	03
8	Under and behind gas stove	15
9	Dustbin area	05

Theoretical Cockroach Trap Worksheet:
Cockroach species: Americana
Date installed: 12th October 2020
Date removed: 17thOctober 2020
Trap Night: 6 days
Location= House no: 3

Grand Total: 67, Total: Trap/Night: 7.4

Trap nos.	Location	Total cockroach captured
1	Beside fridge, against wall, beside trash can	10
2	Pantry self, against back wall	06
3	Upper cupboard	03
4	Kitchen	04
5	Storeroom	08
6	Garage	23
7	Washroom	02
8	Under and behind gas stove	07
9	Dustbin area	04

Theoretical Cockroach Trap Worksheet:
Cockroach species: Americana
Date installed: 19th October 2020
Date removed: 24thOctober 2020
Trap Night: 6 days
Location= House no: 4 (Fast-foods)
Grand Total: 127, Total: Trap/Night: 14.1

Trap nos.	Location	Total cockroach captured
1	Beside fridge, against wall, beside trash can	15
2	Pantry self, against back wall	30
3	Upper cupboard	10

4	Kitchen	12
5	Storeroom	20
6	Garage	25
7	Washroom	02
8	Under and behind gas stove	22
9	Dustbin area	02

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