

[NAE WOI KOREA]

Pest repelling activity based on the presence of repellent treatment

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CESCO Science Lab

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I. Outline

I . Outline

1. Purpose of the test

- 1) To check the degree of contact (number of contacts, residence times) with target pests based on the presence of repellent treatment.

2. Test Condition

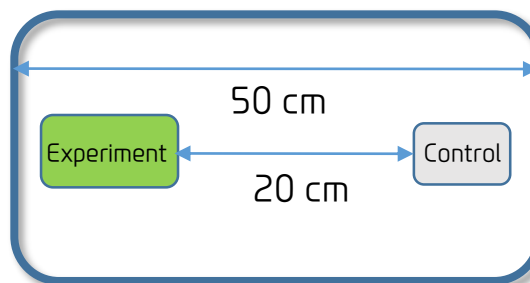
- 1) **Test environment:** 25 ± 1 °C , relative humidity 40–50 %
- 2) **Target pest:** German cockroach adult (same ratio of male and female)
- 3) **Target food:** A slice of bread
- 4) **Experimental group condition:** About 350 μ L (spray three times) of repellent is sprayed on the target food.

In order to check the difference of the lapse of time, the experiment was conducted right after treating repellent and after a week of treating repellent.

- 5) **Control group condition:** In order to meet the same moisture conditions of the repellent, about 350 μ L of distilled water is sprayed on the target food and left for the same time as the experimental group.
- 6) **Experiment setting condition:** Install the experimental group and control group at intervals of about 20 cm in the case 50 cm x 50 cm x 25 cm (W x D x H)
- 7) **Number of experiments:** A total of 6 experiments were conducted with the experiment right after treating repellent (repeated three times) and experiment after a week of treating repellent (repeated three times).



< Figure 1: German cockroach adult >



< Figure 2: Example of experiment case >

X repeated three times

II. Method of experiment

II . Method of experiment

1. Target food location

- 1) Place the control group and experimental group each in the case. (repeated three times)
- 2) Maintain a distance of about 20 cm between the control group and experimental group.

2. Putting target pests

- 1) 16 adult German cockroaches of the same sex ratio were placed into the control group case and experimental group case (repeated three times)



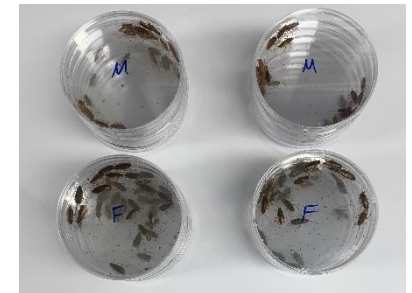
<Figure 3: Control1, Experiment1>



<Figure 4: Control2, Experiment2>



<Figure 5: Control3, Experiment3>



<Figure 6: Target pest>

II . Method of experiment

3. Experimental observation

1) By photographing the experiment case, **observe the number of contact and residence times** of the German cockroaches.

(Three days continuous observation)

- **Experiment right after treating repellent** Observed the target pests in the case Immediately after repellent treatment for three days.
- **Experiment after a week of treating repellent**: Observed the target pests in the case after a week of repellent treatment for three days.

2) The program analyzed the behavior of each target pest at the same time at regular intervals.

- **Contact rate per hour** (time/h)
- **Residence time on contact once** (s/time)

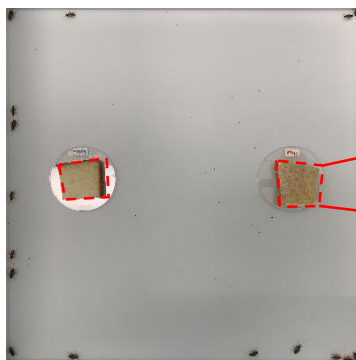
4. Data analysis

1) Standard of contact counting

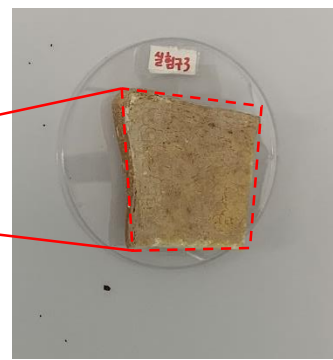
- When a target pest approaches within 0.1 mm of the target food, the program measured it as a contact.

2) Standard of data calculations

- **Contact rate per hour (time/h)**: Daily data was calculated as an average by observing **the number of contacts per target pest for time (h)**.
- **Residence time on contact once (s/time)**: Daily data was calculated as an average by observing **the number of contact and residence times per target pest for time (h)**.



<Figure 7: Example of contact measurement>



<Figure 8: Example of contact measurement enlarged >

III. Result of experiment

III. Result of experiment

1. Experiment results right after treating repellent

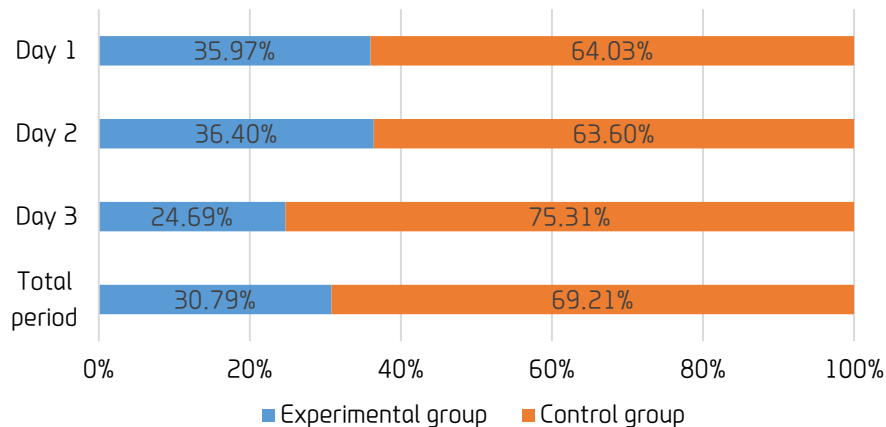
※ **Control group:** Target food right after treating distilled water
Experimental group: Target food right after treating repellent

- 1) The average contact rate of the target pest for three days was about 30.79 % in the experimental group and about 69.21 % in the control group.
- 2) The average time that the target pest contacts the target food once for three days was about 15.68 seconds in the experimental group and about 132.12 seconds in the control group.

<Table 1: Contact rate per hour right after treating repellent> (Measurement: %)

Category	Contact rate per hour (times/h)			
	Day 1	Day 2	Day 3	Total period
Control	64.03	63.60	75.31	69.21
Experimental	35.97	36.40	24.69	30.79

<Note: Daily data was calculated as an average by observing the number of contacts per target pest for time (h).>

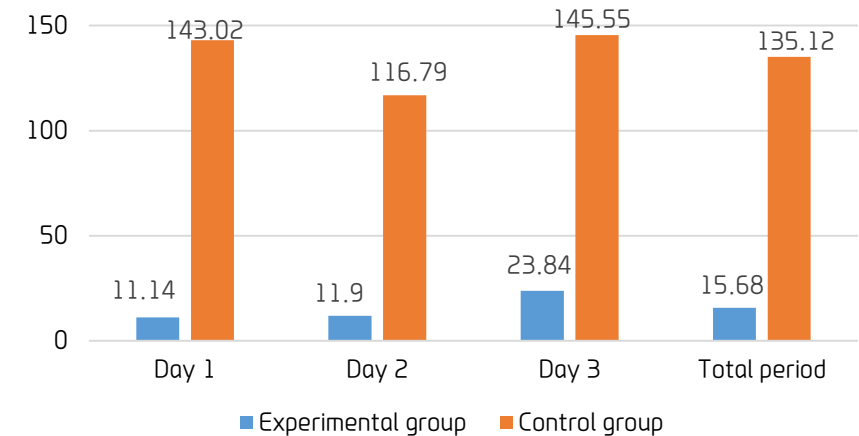


<Figure 9: Contact rate per hour right after treating repellent (time/h)>

<Table 2: Residence time on contact once right after treating repellent> (Measurement: s)

Category	Residence time on contact once (s/time)			
	Day 1	Day 2	Day 3	Total period
Control	143.02	116.79	145.55	135.12
Experimental	11.14	11.90	23.84	15.68

<Note: Daily data was calculated as an average by observing the number of contact and residence times per target pest for time (h).>



<Figure 10: Residence time on contact once right after treating repellent (s/time)>

III . Result of experiment

2. Experiment results after a week of treating repellent

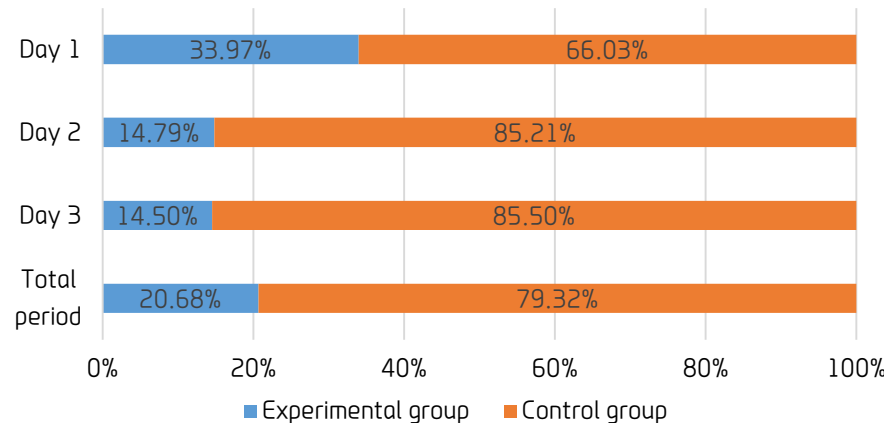
※ **Control group:** Target food after a week of treating distilled water
Experimental group: Target food after a week of treating repellent

- 1) The average contact rate of the target pest for three days was about 20.68 % in the experimental group and about 79.32 % in the control group.
- 2) The average time that the target pest contacts the target food once for three days was about 36.18 seconds in the experimental group and about 237.62 seconds in the control group.

<Table 3: Contact rate per hour after a week of treating repellent> (Measurement: %)

Category	Contact rate per hour (times/h)			
	Day 1	Day 2	Day 3	Total period
Control	66.03	85.21	85.50	79.32
Experimental	33.97	14.79	14.50	20.68

(Note: Daily data was calculated as an average by observing the number of contacts per target pest for time (h).)

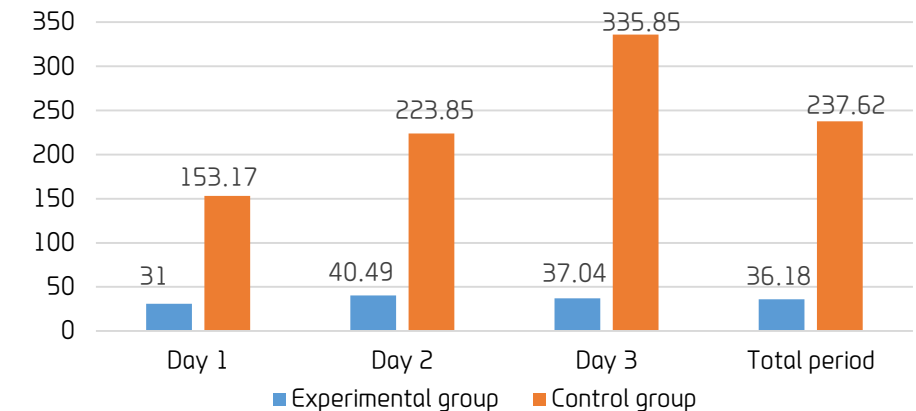


<Figure 11: Contact rate per hour after a week of treating repellent (time/h)>

<Table 4: Residence time on contact once after a week of treating repellent> (Measurement: s)

Category	Residence time on contact once (s/time)			
	Day 1	Day 2	Day 3	Total period
Control	153.17	223.85	335.85	237.62
Experimental	31.00	40.49	37.04	36.18

(Note: Daily data was calculated as an average by observing the number of contact and residence times per target pest for time (h).)



<Figure 12: Residence time on contact once after a week of treating repellent (s/time)>

III . Result of experiment

3. Summary

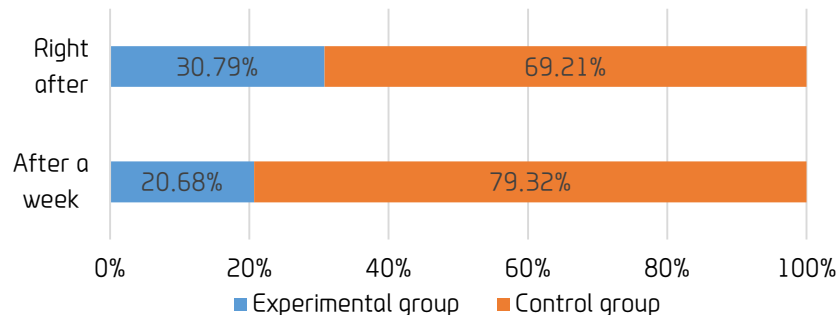
※ **Control group:** Target food treated with distilled water
Experimental group: Target food treated with repellent

- 1) As a result of the contact rate by the target pests in accordance to treating repellent for three days, It was about 30.79 % in the experimental group right after treating repellent and about 69.21 % in the control group. Also, it was about 20.68 % in the experimental group after a week of treating repellent and about 79.32 % in the control group.
- 2) As a result of the Residence time on contact once by the target pests in accordance to treating repellent for three days, it was about 15.68 seconds in the experimental group right after treating repellent and about 135.12 seconds in the control group. Also, it was about 36.18 seconds in the experimental group after a week of treating repellent and about 237.62 seconds in the control group.
- 3) As a result of the contact rate per hour and the residence time on contact once by the target pest for three days, the experimental group showed lower values than the control group regardless of the lapse of time.

< Table 5: Compare of the contact rate per hour > (Measurement: %)

Category	Contact rate per hour (times/h)	
	Right after treating repellent	After a week of treating repellent
Control	69.21	79.32
Experimental	30.79	20.68

(Note: Daily data was calculated as an average by observing the number of contacts per target pest for time (h).)

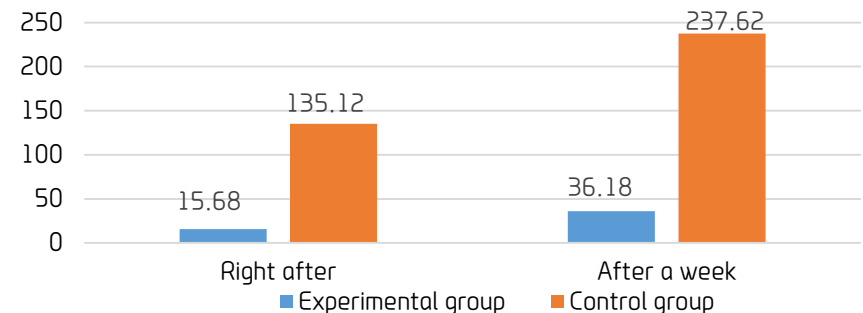


<Figure 13: : Compare of the contact rate per hour (time/h)>

< Table 6: Compare of the residence time on contact once > (Measurement : s)

Category	Residence time on contact once (s/time)	
	Right after treating repellent	After a week of treating repellent
Control	135.12	237.62
Experimental	15.68	36.18

(Note: Daily data was calculated as an average by observing the number of contact and residence times per target pest for time (h).)



<Figure 14: Compare of the residence time on contact once (s/time)>

⌘ Experiment photos

❖ Experiment photos



❖ Experiment photos



※ Experiment photos



※ Experiment photos



※ Experiment photos (Added on January 13th)



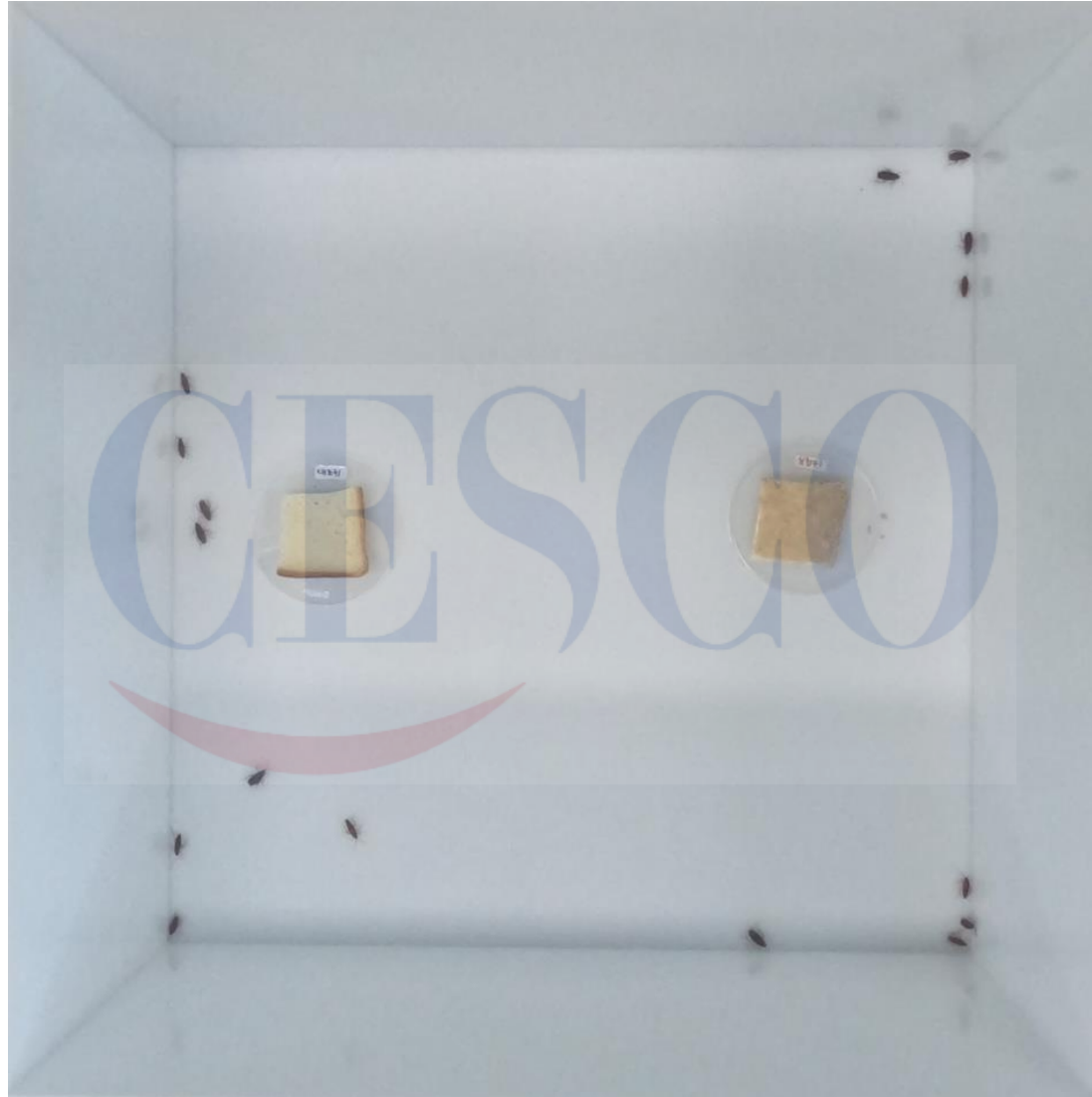
※ Experiment photos (Added on January 13th)



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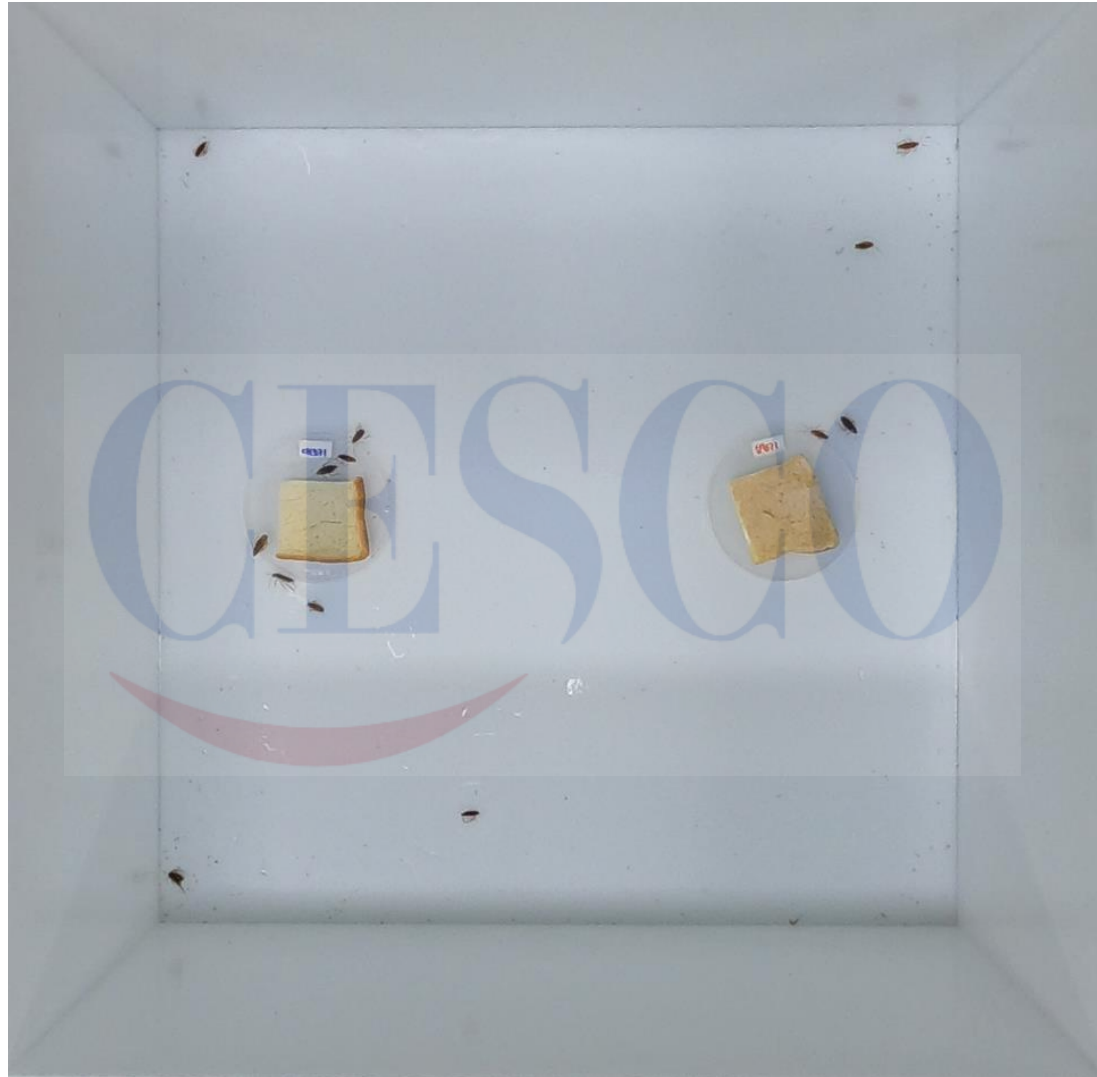
※ Experiment photos (Added on January 13th)



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Thank you.