

THE IMPACT ON INDIVIDUALS AND COMMUNITY HEALTH BY KITCHEN INSECTS AS BACTERIAL MECHANICAL VECTORS, TAIF, KSA

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ABSTRACT

This paper was designed to evaluate the kitchen insects bacterial mechanical vectors (Cockroaches) and its impact on individual and community health in Taif, KSA, the mean incidence of bacterial loads turbidity were (3rd, 1st, 2nd, 4th and 5th group); (98.0, 97.2, 96.9, 96.5 and 96.2%) respectively, the mean was 96.96%. The mean incidence of bacterial growth evaluation were (+++ = heavy growth) in all groups, were in (3rd, 1st, 2nd, 4th and 5th group); (78.5, 77.2, 76.3, 76.1 and 76.0%) respectively, the mean revealed 76.82%. The mean incidence of bacterial Colony Forming Unit (CFU) / mL evaluation, the mean was (3.3 X 10⁵) / mL, were (3.8, 3.5, 3.3, 3.1 and 2.9 X10⁵) / mL, for (3rd, 1st, 2nd, 4th and 5th group) respectively. The mean incidence of bacterial Spp were isolated, which produced 12 bacterial Spp were (E. coli, Klebsiella pneumoniae, Pseudomonas aeruginosa, Proteus Spp and Citrobacter Spp) as (19.1, 16.2, 13.3, 12.2 and 8.3%) respectively, followed by bacteria (Shigella Spp, Staph. Spp, Strept. Spp, Serratia Spp, Bacillus Spp, Salmonella Spp and Campylobacter Spp) were (7.5, 6.4, 4.5, 4.2, 3.8, 2.4 and 2.1%) respectively. The conclusions confirmed the role of Cockroaches as a bacterial mechanical vector, which transferred and dropped of the pathogenic bacteria which caused food contamination, food poisoning and infectious diseases, that effected on the individuals and community health. So the insect control center (Insecticides) must be arranged to eradicate the Cockroaches and also the kitchens hygiene must be improved to protect the individuals and community health.

INTRODUCTION

The *Cockroaches* were the most important in areas with food, waste, bad house, un-clean utensils, un-clean street and food shops. They lived in bad houses, restaurants and hospitals[1-7]. They presented of huge numbers transported with food utensils[8], consumed waste, transmitted bacterial disease as mechanical vectors[9-11], They consumed sewage and distributed pathogenic bacteria[12], so collected dirt including bacteria on their cuticle[13-14], that helped in mechanical transmission of food poisoning and disease-causing bacteria[15]. The bacterial strain were isolated from *Cockroaches* external surfaces[16-19], were isolated caused food spoilage[20-21], were revealed more than 40 pathogenic strains[22], released pathogenic bacteria on nutriment and tools[23]. They revealed as dripping and bacterial mechanical vector causing diseases[24]. The bacterial strains were isolated in high percent from their external surfaces[25-26]. They had exactly loud bacterial pathogens on their surfaces and had spread specially gastroenteritis bacteria[27]. The bacterial were isolated from external surfaces as bacterial pathogens[28].

The main objective was to investigate the presence of *Cockroaches* in different kitchens represented reservoir and bacterial mechanical vector, that were on the body external surfaces, which affected the individuals and community health. The transport of pathogenic bacteria caused microbial food contamination, food poisoning and infectious diseases. This helped in the spread of bacterial diseases affecting the individuals and community health. The plan could helped to determine the bacterial loads and types on the *Cockroaches* external surfaces from the different kitchens. That to prove the bacterial danger were transmitted and the kitchens hygiene must be improved to decrease the *Cockroaches* as bacterial mechanical vector.

MATERIALS AND METHODS

- **Samples collection:** A total of 50 *Cockroaches* were collected at Taif region from different kitchens[29]. **Samples washing:** The *Cockroaches* were immobilized and were prepared for washing[30].

- **Turbidity determination:** The washing solutions were detected for turbidity[31-34], the bacterial loads were calculated by Equation Ratio (ER): $([S. R. /F. MSC R.100\%] \times 100)$ [35].
- **Bacterial isolation:** The washing solution were cultured by "Ideal Bacterial Methods"[36].
- **Bacterial growth (%) evaluation:** The bacterial colony were counted by the Equation Ratio (ER): $([W. S. C. C. / C. C. C.] \times 100)$ [37].
- **Bacterial Cell Forming Unit / mL (CFU/mL) evaluation:** That were done and means were calculated[38].
- **Bacterial identification:** The identification were done by the Micro-Scan device[39].
- **Data analysis:** The all data were recorded and analyzed[40].

RESULTS AND DISCUSSION

Table 1 and graph 1: The mean incidence of bacterial loads turbidity

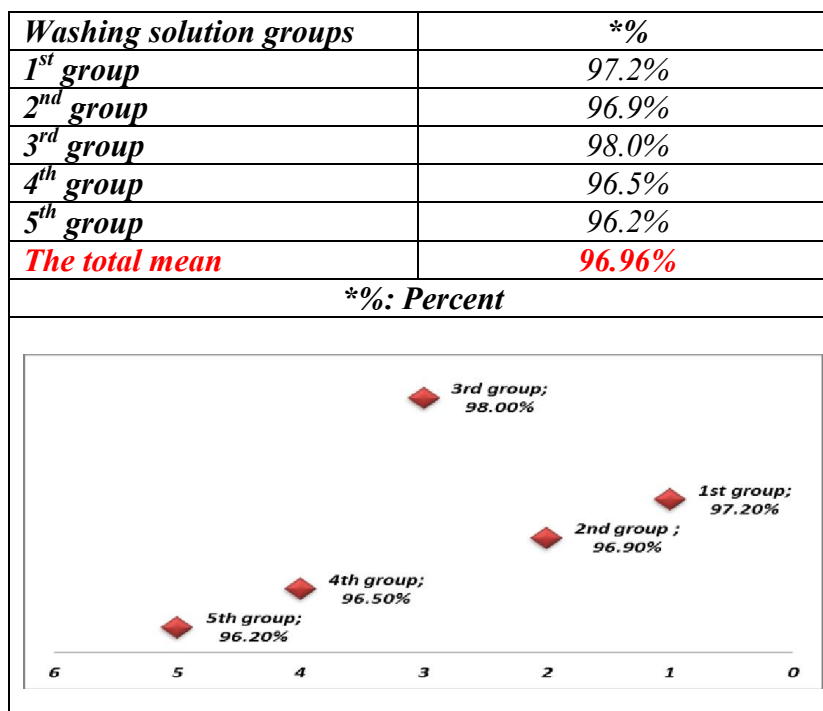


Table 1 and graph 1 showed the mean incidence of bacterial loads turbidity, the amount of turbidity was the higher in arranged as (3rd group, 1st group, 2nd group, 4th group and 5th group) as followed: (98.0, 97.2, 96.9, 96.5 and

96.2%) respectively, the mean found as 96.96%. The turbidity level was nearly closed to 100%, the bacterial loads of the *Cockroaches* external surfaces completed to food contaminate and articles. That indicated the huge bacterial sources on the *Cockroaches* and revealed the un-hygienic in the kitchens which increased the bacterial contamination and transmitted the bacteria[8-10, 12-15].

Table 2 and graph 2: The mean incidence of bacterial growth *% evaluation

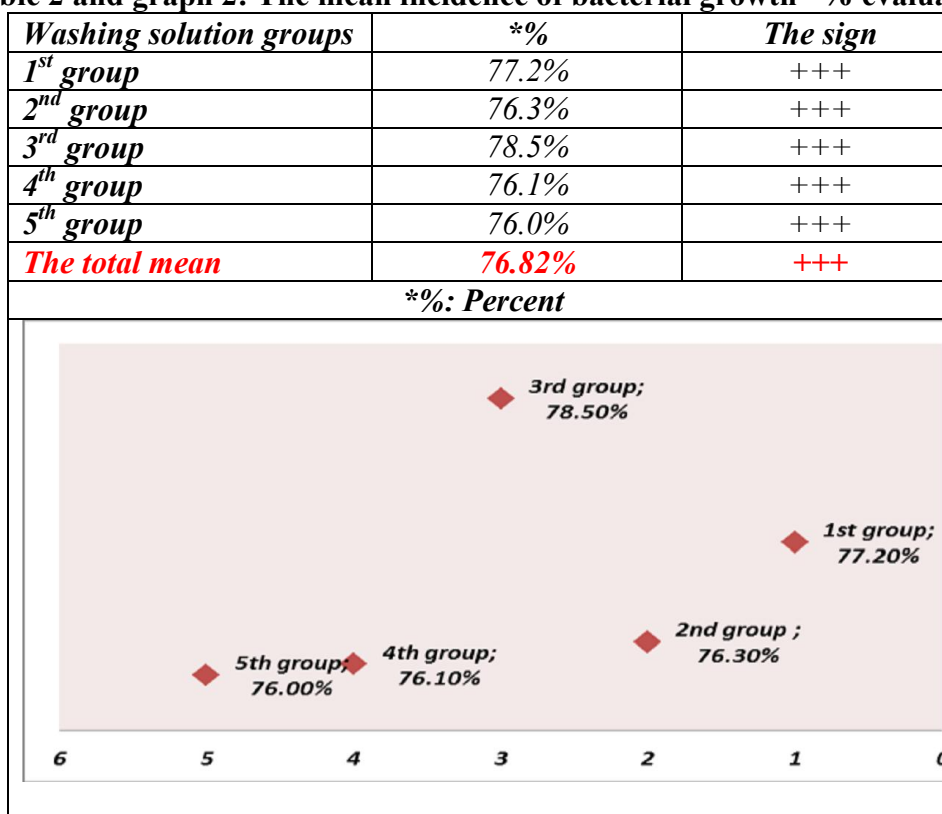


Table 2 and graph 2 showed the mean incidence of bacterial growth evaluation, the amount of bacterial growth based on the signs were as (+++ = heavy growth) in all groups, but the difference in the percentage of bacterial growth was as follow: (3rd group, 1st group, 2nd group, 4th group and 5th group) were as (78.5, 77.2, 76.3, 76.1 and 76.0%) respectively, the mean revealed as 76.82%. The proportions ranged from about (76-79%), that indicated the activity of the bacteria in growth as soon as they moved from the *Cockroaches* external surfaces to the suitable growth media. This attained the bacterial contamination and the ability to rapidly growth for bacterial causing food contamination and spreading of the diseases in the environment or through which the *Cockroaches* moved [9-12, 15].

Table 3 and graph 3: The mean incidence of bacterial *CFU/mL evaluation

<i>Washing solution groups</i>	<i>*CFU/mL</i>	<i>Cell number</i>
<i>1st group</i>	3.5×10^5	350000
<i>2nd group</i>	3.3×10^5	330000
<i>3rd group</i>	3.8×10^5	380000
<i>4th group</i>	3.1×10^5	310000
<i>5th group</i>	2.9×10^5	290000
<i>The total mean</i>	3.3×10^5	330000

***CFU/mL: Cell Forming Unit/mL**

Group	Cell Number
5th group	290000
4th group	310000
3rd group	380000
2nd group	330000
1st group	350000

Table 3 and graph 3 showed the mean incidence of bacterial CFU/mL evaluation, the live bacterial cell gave a complete colony, the mean was (3.3×10^5) / mL. The sequence of groups was as follows: ($3.8, 3.5, 3.3, 3.1$ and 2.9×10^5) / mL, for (3rd group, 1st group, 2nd group, 4th group and 5th group) respectively. The result was that living cells were able to produce colonies that were capable of causing microbial food contamination and spread of pathogenic bacterial agents which caused diseases, as well as the spread of infectious diseases. This was evidence of their ability because they were still alive and produce new individuals in addition to infectious diseases caused by bacterial contamination[19-20].

Table 4 and graph 4: The mean incidence of bacterial *Spp* isolated

Bacterial <i>Spp</i>	%
<i>E. coli</i>	19.1%
<i>Klebsiella pneumoniae</i>	16.2%
<i>Pseudomonas aeruginosa</i>	13.3%
<i>Proteus Spp</i>	12.2%
<i>Citrobacter Spp</i>	8.3%
<i>Shigella Spp</i>	7.5%
<i>Staph. Spp</i>	6.4%
<i>Strept. Spp</i>	4.5%
<i>Serratia Spp</i>	4.2%
<i>Bacillus Spp</i>	3.8%
<i>Salmonella Spp</i>	2.4%
<i>Campylobacter Spp</i>	2.1%
The total	100%

Spp: Species, %: Percent, *E. coli*: *Escherichia coli*, *Staph.*: *Staphylococcus*, *Strept*: *Streptococcus*

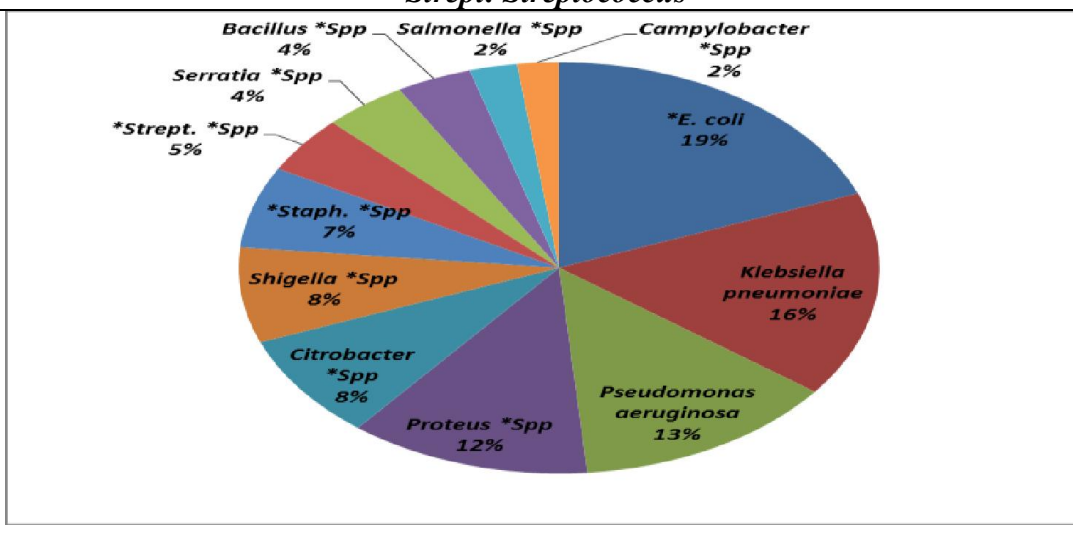


Table 4 and graph 4 showed the mean incidence of bacterial *Spp* isolated, that produced 12 bacterial *Spp* causing food contamination, food poisoning and infectious diseases, the clearest percentage were on (*E. coli*, *Klebsiella pneumoniae*, *Pseudomonas aeruginosa*, *Proteus Spp* and *Citrobacter Spp*) as (19.1, 16.2, 13.3, 12.2 and 8.3%) respectively, then which represented the

percentages that were infectious disease-causing and their incidence were more than double that of others isolated bacteria. Followed by bacteria were (*Shigella Spp*, *Staph. Spp*, *Strept. Spp*, *Serratia Spp*, *Bacillus Spp*, *Salmonella Spp* and *Campylobacter Spp*) as (7.5, 6.4, 4.5, 4.2, 3.8, 2.4 and 2.1%) respectively, whereas that was in the lower proportions, although they were present in small numbers but caused serious infectious diseases for humans[16-19, 20-22, 24-28].

CONCLUSIONS

This work concluded which confirmed the role of *Cockroaches* was as a bacterial mechanical vector, transferred and dropped pathogenic bacteria which caused food contamination, food poisoning and infectious diseases, that effect was on the individuals and community health. So the insect control center (Insecticides) must be arranged to eradicate the *Cockroaches* and the kitchens hygiene must be improved to protect the individuals and community health.

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التأثير على الأفراد وصحة المجتمع عن طريق حشرات المطبخ مثل الناقلات الميكانيكية للبكتيريا، الطائف، المملكة العربية السعودية

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الخلاصة

تم تصميم هذه الورقة لتقييم حشرات المطبخ الناقلات الميكانيكية للبكتيريا (الصراصير) وتأثيرها على صحة الفرد والمجتمع في الطائف بالمملكة العربية السعودية، كان متوسط معدل الحمولات البكتيرية بالتعكر (٣، ١، ٢، ٤ و ٥ المجموعة) . (٩٨.٠، ٩٧.٢، ٩٦.٩، ٩٦.٥، ٩٦.٢٪) على التوالي، كان المتوسط ٩٦.٩٦٪. كان معدل حدوث النمو البكتيري (+++) (النمو الكثيف) في جميع المجموعات، في (٣، ١، ٢، ٤ و ٥ المجموعة)؛ (٧٨.٥، ٧٧.٢، ٧٦.٣، ٧٦.١، ٧٦.٠٪) على التوالي، كشف المتوسط ٧٦.٨٢٪. وكان متوسط معدل وحدة تكوين المستعمرات البكتيرية CFU / مل، وكان المتوسط (٣.٣ × ١٠^٥) / مل، (٣.٨، ٣.٥، ٣.٣، ٣.١، ٢.٩ × ١٠^٥) / مل، للمجموعات (٣، ١، ٢، ٤ و ٥) على التوالي. تم عزل متوسط نسبة البكتيريا البكتيرية التي تنتج ١٢ جنس من البكتيريا (*E. coli*, *Klebsiella pneumoniae*,

Pseudomonas aeruginosa, Proteus Spp and Citrobacter Spp) على التوالي (١٩.١ و ١٦.٢ و ١٣.٣ و ١٢.٢ و ٨.٣٪) على التوالي،
 (Shigella Spp, Staph. Spp, Strept. Spp, Serratia Spp, Bacillus Spp, Salmonella Spp and Campylobacter Spp) كانت (٧.٥، ٦.٤، ٤.٥، ٤.٢، ٣.٨، ٢.٤، ٢.١٪) على التوالي. وأكدت الاستنتاجات دور الصراصير كناقل ميكانيكي بكتيري في نقل والبكتريا المسببة للأمراض التي تسبب تلوث الأغذية والتسمم الغذائي بالطعام والأمراض المعدية التي أثرت على الأفراد وصحة المجتمع. لذلك يجب أن يتم ترتيب مركز مكافحة الحشرات (الحشرات) للقضاء على الصراصير وأيضا يجب تحسين النظافة المطبخ لحماية الأفراد وصحة المجتمع.

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