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BACTERIOLOGICAL EVALUATION OF POULTRY FEEDS AND FEED INGREDIENTS IN ASSIUT GOVERNORATE

(With 7 Tables)

By

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التقييم البكتريولوجى لبعض علائق الدواجن ومكونا تها فى محا فظة أسيوط

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شملت الدراسه التجميع والفحص البكتريولوجى لعدد ٨٢ عينه من علائق الدواجن ومكوناتها ضمت ٢٢ عينه منتج نهائى ، ١٨ عينه مركزات أعلاف وكذلك ٤٢ عينه من مكونات الأعلاف النباتيه من وحدات إنتاج علائق الدواجن لكل من بنى مر، عرب العوامر، درنكه، ريفا: ومنفلوط بمحافظة أسيوط. أسفرت الدراسه عن عزل العديد من عترات الميكروبات المختلفه والتى لها أهميه بالغه لصحة وانتاجية الدواجن. وقد تراوحت متوسطات درجات الأس الهيدروجينى الإجمالى للعينات بين ٤٥ر٥ ± ٥١ر٠ إلى ٧٢ر٦ ± ٠٢ر٠ قبل التعقيم بينما تراوحت من ٥١ر٥ ± ١٦ر٠ الى ٦٦ر٦ ± ٠٣ر٠ بعد العقيم كما تراوحت متوسطات العد الطبقى القياسى العام لكل ١ جرام عند ٣٧ °م بين (٠٧ر٣ ± ٢١ر١) ١٠ الى (٨ر١٠ ± ٦ر١) ١٠ وبحد أدنى ١ X ١٠ وأقصى ٨ر٢ X ١٠ . وقد تبين من الدراسة تلوث العديد من العينات بالميكروبات البرازية تمثلت بمتوسطات عاليه لكل من العد الطبقى للميكروبات القولونييه والسبحيه البرازيه والميكروب اللاهوائى كلستريديوم ولش. وقد تمت مناقشة الأهميه الصحيه لأهم عترات الميكروبات المعزوله بالأضافه الى التوصيات والاشتراطات الصحيه الواجب توافرها لمنع او تقليل حدوث التلوث الميكروبى لعلائق الدواجن ومكوناتها حفاظا على الثروة الداجنه وصحة المستهلك.

SUMMARY

Eighty two samples of apparently normal poultry feeds and feed ingredients were collected from some poultry processing plants in different localities at Assiut Governorate (Beni-Mor; Arab El-Awamer; Dronka; Rifa and Manfalout). The samples included, poultry rations (22), and concentrate mixtures (18) feed ingredients (42). The pH values were slightly acidic and their over all mean values ranged from 5.54±0.51 to 6.72±0.02 and from 5.51±0.0.16 to 6.66±0.03 before and after autoclaving, respectively. The aerobic plate count showed a high bacterial load varied from (3.07±1.021) 10^4 to (10.8±1.6) 10^4 with minimum count of $1x10^3$ and a mixiumum of $2.8x10^5$ CFU/g. The obtained results revealed that the lowest colony count was in the white corn while the wheat bran showed the highest colony count. The mean values of

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the total coliform/g ranged from (1.22±0.46) 10^2 to (2.13±0.62) 10^4 with a minimum count of $1.2x10^2$ in soyabean meal and a maximum total coliform count of $5.7x10^4$ in - laying rations. Typical *E. coli* could be recovered from the final rations and most of the feed ingredients. The mean count varied from zero to (1.10±0.54)10^3 .The examined samples revealed that both the concentrate mixtures and white corn were free from *E.coli,*. *Faecal streptococci* count/100g ranged from zero to (2.50±0.97)10^2 and the maximum count was recorded in the wheat bran samples. However, soyabean meal, yellow corn and white corn are free from *Cl. perfringens* but the count was high in case of the concentrate mixtures. The mean values ranged from zero to $7.7x10^2$/g. Wide varities of pathogenic and potentially pathogenic organisms were isolated with total over all incidence percentages of *Staph. epidermidis* (14.52%), *Strept. faecalis* (9.28%), *Staph. aureus* (8.06%), *Proteus rettgeri* (6.85%), *E.coli* (6.45%), *Cl. perfringens* (6.45%), *Alcaligenes faecalis* (5.64%), *Pseudomonas aeruginosa* (4.44%) beside other enteric organisms with variable total over all percentages. The hygienic significance of the isolates and the protective measures that must be considered were discussed.

Keywors: *Bacteriological , evaluation, poultry feeds, feed ingredients, Assiut*

INTRODUCTION

Mixed feeds and their basic raw plant materials are considered unexplored area of poultry science. They represent a main source of disease spread so they must receive the proper bacteriological attention. Although *BISCIELLO & SCHRADE (1974)* failed to recover *Salmonella* from 30 bone meal samples, but other authors isolated *Salmonellae* from the poultry feeds with percentages ranged from 3-80% (*SHOTTS et al.,1961 and HACKING,1978).* However, *COX et al.,1983* stated that the most frequently encountered members of family Enterobacteriaceae were *Enterobacter agglomerans, E.locae and Klebsiella pneumonae*. He also added that, there is no correlation between the level of Enterobacteriaceae and the presence of *Salmonella* in the poultry feeds. *TABIB et al., (1981)* recorded that the microbial activity of broiler, layer and turky feeds was directly influenced by their pH values so the later is considered as a useful indicator of the feed microbial quality.The present study reports on the microbilogical quality of poultry feeds, concentrate mixtures and feed ingredients including the count of colony forming units, Coliform, *E.coli*, *Enterococcus* and *Cl. perfringens* as well as the isolation and identification of pathogenic and potentially pathogenic microorganisms. Moreover, pH values were also determined in the samples of poultry feeds and feed ingredients as a related index for their microbial quality.

MATERIALS and METHODS

Collection of the samples:-

The samples of poultry feeds (22), concentrate mixtures (18) and feed in-

gredients (42) were collected from some poultry processing plants in different localities at Assiut Governorate (Beni-Mor, Arab El-Awamer, Dronka, Rifa and Manfalout). The samples were collected in sterile plastic bags and transported to the laboratory for their microbiological and physical examination with a minimum of delay.

pH: was determined on 5% sluries in distilled water before and after autoclaving at 121 °C for 15 min. according to *TABIB et al. (1981)*, using pH meter (Model 3200, Jenway, U.K.).

Preparation of the samples for bacteriological examination:-

Fifty grams of each sample were placed in sterile flask with 450 ml of sterile physiological saline and vigorously shaken for 1 min. to make 1:10 basal dil. Ten fold serial dilutions were made till 10^{-7} (Cox et al.,1983).

Aerobic plate count:-

The colony forming units (CFU) were carried out according to A.P.H.A. (1985) by using standard plate count agar (Oxoid).

Coliform count:-

Enterobacteriaceae were counted in pour plates of violet red bile agar with 1% glucose (*MOSSEL et al., 1962; TABIB et al.,1981 and BAILY & SCOTT, 1994*).

***Escherichia coli*:-**

Was counted according to *FINEGOLD and BARON (1986) and QUINN et al.(1994)*.

Enumeration of Enterococci:-

Entero-coccus organisms were counted by MPN technique as described by *COLLINS et al. (1991) and ELMER et al. (1994)*.

Enumeration of *Cl. perfringens*:-

Were carried out according to *BEERENS et al. (1980)*. On the other hand, pour plate technique with tryptose sulfite cycloserine agar was also used *(TOPLY & WILSON,1990)*.

Isolation and identification of pathogenic and potentially pathogenic organisms:-

***Staphylococci*:-**

Staph. medium 110, Manitol salt agar and blood agar media were used for isolation of *Staphylococci* according to *CRUICKSHANK et al. (1980)* and *DEVRIESE & HAJEK (1980)*.

***Salmonella* and other enteric pathogens:-**

This was carried out and fullfilled according to *KELLY et al. (1985); FINGOLD & BARON (1986) and QUINN et al. (1994)*.

RESULTS

The obtained results are tabulated in tables (1-7).

DISCUSSION

The transfer of pathogenic and potentially pathogenic organisms from feeds to poultry to man is an important pattern of contamination and infection, thus, practical and effective methods must be developed and utilized to eliminate them from the feed supply *(COX et al.,1983)*.

The pH values in the examined samples are shown in table,1. Most of

the mean pH values of feeds and feed ingredients were slightly acidic and ranged from 5.54 ± 0.51 to 6.72 ± 0.02 before autoclaving and varied from 5.51±0.16 to 6.66±0.03 after autoclaving. The obtained results more or less agree with that obtained by *TABIB et al. (1981)*. pH of the substrate can change as a result of microbiological growth, thus it might be a useful indicator of microbial activity. The CFU/g of the different poultry feeds and feed ingredients are illustrated in tables 2 & 3. The mean values of the CFU/g ranged from $3.07\pm1.21x10^4$ to $10.8\pm1.6x10^4$. The minimum count was $1x10^3$, while the maximum count was $2.8x10^5$. The results showed that the lowest colony count was in the white corn while the wheat bran showed the highest colony count. Results given in tables 2 & 3 revealed that all examined samples proved to be highly contaminated with enterobacteriaceae. The mean values of total coliform count/g ranged from $1.22\pm0.46x10^2$ to $2.13\pm0.62x10^4$. The minimum count/g was $1.2x10^2$ (soyabean meal) while the maximum count was $5.7x10^4$ (laying rations). The concentrate mixtures and the white corn had the lowest counts. On the other hand, the laying rations contain the highest *coliform* count ($2.13\pm0.62x10^4$). The obtained results are more or less in agreement with that recorded by *COX et al.(1983)* who found that the final feeds contain high *coliform* count than bone and meat meal.

It is evident from the results recorded in tables 2 & 3 that, *E.coli* could be detected in the final rations and most of the feed ingredients. The mean count/g varied from zero to $1.1\pm0.54x10^3$. The maximum *E.coli* count was $4x10^3$ (laying rations) while the minimum count was zero for all the examined samples. The results revealed also that both concentrate mixtures and white corn are free from *E.coli*.

Faecal streptococci could not be detected in the concentrate mixtures (Tables 2 & 3). On the other hand, the mean values for *Enterococcus* count/100g ranged from zero to $2.5\pm0.97x10^2$. The maximun *Enterococcus* count was recorded in the wheat bran ($9.0x10^2$/100g).

Absence of *E.coli* and *faecal Streptococci* my be attributed either to the heat treatment during manufacturing or that these products were not subjected to the faecal contamination.

The disribution of *Cl.perfringens* in the examined samples is shown in tables 2 & 3. The mean values of *Cl. perfringens* were ranged from zero to $7.7x10^2$/g. However, soyabean meal, yellow corn and white corn are free from *Cl.perfringens*.

In general the animal protein sources and bad stored grains offer great opportunities for contamination with pathogens in the final rations *(HALVORSON,1974)*.

Bacterial isolates:

Data presented in tables 4,5,6 and 7 proved that the feed samples are highly contaminated with many pathogenic and potentially pathogenic organisms.

It is easily noticed that *Staphylococcus aureus* represents one of the most important contaminant and could be isolated from the final rations, concentrate mixtures and feed ingredients with over all frequencies of 27.27; 11.11 and 28.57%, respectively, and with a total over all incidence of 8.06%. It is a causative agent of septicaemic synivitis, arthiritis with severe losses of chicks, spondylitis, omphalitis and bacterial endocarditis *(DEVRIESE, et al.,1975)*. Moreover, necrotic foci in the liver and spleen beside granulomatous lesions in the lung with mortality up to 5% in chickens *(HORIUCHI, et al.,1969)*.

However, *Streptococcus faecalis* colud not be detected from the concentrate mixtures but were isolated with over all frequency percentages of 36.36 & 35.71 from the final rations and feed ingredients, respectively, and with a total over all incidence of 9.28% (Tables 4,5,6 & 7). *Strept faecalis* is being increasingly implicated in a variety of diseases to broilers as acute streptococcal septicaemia and endocarditis of chickens with losses up to 5% ,as well as, growth depression *(HUHTANEN and PENSACK , 1965)*.

Although the concentrate mixtures were free from *E.coli* but it represents the highest contaminant in the final rations with an over all frequency 40.91% and a total over all incidence of 6.45% (tables 4, 5, 6 & 7). The organism is responsible for various diseases of major economic losses to poultry industry as Coliba-cillosis, Hajris diseases, Coligranuloma, Peritonitis, Salphingitis Synovitis, Omphalitis, air sac diseases and various outbreaks of coli-septicaemia *(HOFSTAD et al. 1978)*.

Is also evident from the obtained results that *Pseudomonas aeroginosa* could be isolated with over all frequencies of 27.27; 11.11 and 7.14% from the final rations, concentrates and feed ingredients, respectively (tables 4, 5 & 6). The organism is incriminated in a disease called Pseudomoniasis characterized by profuse diarrhaea, generalized oedema of the head and wattles *(MAZZETTI,1972)*. On the other hand, *Klebsiella pneumonae* was only isolated from the final rations with an over all frequency of 9.09%, but not detected in both concentrate mixtures and feed ingredients. *Klebsiella* is a caustive agent of some respiratory and urinary infections (Cowan et al., 1960).

Salmonella species could not be detected from all examined samples. On the other hand, *Cl.perfringens* could be isolated with over all frequencies of 31.82; 33.33 and 7.14% from final rations, concentrates and feed ingredients, respectively (tables 4, 5 and 6) and with a total over all incidence of 6.45% (Table 7). The high frequency percentage of *Cl.perfringens* in the feed concentrates may be due to to insufficient heat treatment and resistance of their spores during processing or due to the post manufacturing contamination. The or-ganism is responsible for sporadic disease of chickens "Necrotic entritis" beside depression, decreased

appetite, reluctance to move and ruffled feathers in older birds. Birds are often found dead with no previous clinical illness. Furthermore, *Cl. perfringens* is one of the causative agents in outbreak of gangrenous dermatitis disease in chickens and turky from 17 days to 20 weeks of age *(PURCHASE et al., 1989)*.

Other organisms of minor health significance were also recovered with variable over all frequency percentages as *Staphylococcus epidermidis, Alcaligenes faecalis, Klebsiella rhinoscleromatis, Enterobacter cloecae, E.agglomerans, Serratia liquificans, S.rubidae, Proteus morganii, P.ettegri, P.mirabilis, P. vulgaris, Providancia species, Citrobacter freundii, C.versus and Hafnia species* (tables 4-6).

The present data suggest that feed associated microbiological problems are more widespread than is commonly believed. Moreover, the products and techniques to correct microbilogical problems are underutilized.

In general, the good feed manufacturing practice, heat treatment and correct handling and storage of raw materials and finished feeds which includes keeping moisture level very low are considered the main measures that must be used to minimize risks of poultry feeds and feed ingredients.

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Table (1): Statistical pH values of poultry feeds and feed ingredients.

P. feeds & ingredients	No.of samples	Before autoclaving			After autoclaving		
		Min	Max	Mean	Min	Max	Mean
Laying rations	9	5.97	6.34	6.16±0.05	6.08	6.51	6.34±0.06
Starters (Broilers)	13	6.04	6.25	6.17±0.02	6.02	6.37	6.17±0.29
Conc., Layers	7	6.13	6.12	6.17±0.01	6.11	6.49	6.22±0.05
Conc., broilers	11	5.82	6.11	5.97±0.03	5.79	6.15	5.96±0.03
Soyabean meal	13	6.58	6.81	6.72±0.02	6.42	6.79	6.66±0.03
Yellow corn (Maiz)	14	4.19	6.08	5.54±0.51	4.06	6.13	5.51±0.16
White corn	3	5.92	5.98	5.94±0.02	5.91	6.07	5.98±0.06
Wheat bran	12	6.27	6.73	6.48±0.05	6.23	6.71	6.43±0.06

Table (2): Statical snalysis of microbiological counts of poultry feeds and feed ingredients

P. feeds & ingredients	Samples No.	Total colony count/g			Total Coliform count/g			Total E. coli count/g		
		Min	Max	Mean	Min	Max	Mean	Min	Max	Mean
Laying ration	9	$1x10^5$	$1.3x10^5$	$5.42x10^4$ ±1.54	$1.3x10^3$	$5.7x10^4$	$2.13x10^4$ ±0.62	0	$4x10^5$	$1.1x10^3$ ±0.54
Conc. (layers)	7	$3x10^4$	$1.2x10^5$	$4.9x10^4$ ±1.32	$1.9x10^2$	$1.2x10^4$	$1.22x10^3$ ±0.46	0	0	0
Starters	13	$5x10^3$	$1.4x10^5$	$4.6x10^4$ ±1.46	$8.2x10^2$	$3.8x10^4$	$10.7x10^3$ ±2.88	0	$2x10^3$	$2.6x10^2$ ±1.71
Conc. (broiler)	11	$1.6x10^3$	$1.7x10^5$	$3.3x10^4$ ±1.46	$2.1x10^2$	$4.2x10^3$	$1.8x10^3$ ±0.48	0	0	0
Soyabean meal	13	$5.8x10^3$	$2.8x10^5$	$7.47x10^4$ ±2.44	$1.2x10^2$	$1.0x10^5$	$4.1x10^3$ ±0.94	0	6.6x10	2.4x10 ±8.13
Yellow corn	14	$3.7x10^3$	$1.2x10^5$	$5.65x10^4$ ±1.04	$4.8x10^2$	$2.4x10^5$	$6.8x10^3$ ±1.87	0	2x10	0.3x10 ±3.61
White corn	3	$1.1x10^4$	$4.2x10^4$	$3.07x10^4$ ±1.21	$2.0x10^2$	$8.0x10^2$	$5.7x10^2$ ±2.3	0	0	0
Wheat bran	12	$8.9x10^3$	$1.9x10^5$	$1.08x10^5$ ±0.16	$4.0x10^2$	$3.6x10^4$	$1.4x10^4$ ±4.22	0	1.1x10	0.8x10 ±1.23

Table (2): Continue

P.feeds & feed ingredients	Sample No.	Total Enterococcus, MPN/100g			Total Cl.perfringens/g		
		Min	Max	Mean	Min	Max	Mean
Laying ration	9	0	45	24.4 ±6.64	0	$1x10^3$	$1.1x10^2$
Conc. (layers)	7	0	0	0	0	$1x10^3$	$5.7x10^2$
Starters	13	7	95	18.38 ±6.73	0	$1x10^3$	$7.7x10^2$
Conc. (broiler)	11	0	0	0	0	$1x10^2$	3.3x10
Soyabean meal	13	17	35	25.15 ±1.69	0	0	0
Yellow corn	14	50	115	83.57 ±5.79	0	0	0
White corn	3	17	20	18.0±1.22	0	0	0
Wheat bran	12	80	9x102	$2.5x10^2$ ±0.97	0	1x10	1.7

Table (3): Statistical microbiological mean values of different poultry feeds and feed ingredients.

feeds & Ingredient	No.	(CFU/g)x10^4	T. coliform /g	E.coli /g	F.Strep. MPN/100	Cl.perfrinens /g
Laying ration	9	5.42±1.54	2.13x10^4±0.62	1.1x10^3±0.54	24.4±6.64	1.1x10^2
Starter	13	4.6±1.46	10.7x10^3±2.88	2.6x10^2±1.71	18.38±6.63	7.7x10^2
Concentrates (Layer)	7	4.9±1.32	1.22x10^2±0.46	0	0	5.7x10^2
Concentrates (Broiler)	11	3.3±1.16	1.8x10^3±0.48	0	0	3.3x10
Soyabean meal	13	7.47±2.44	4.1x10^3±0.94	2.4x10±3.13	25.15±1.69	0
Yellow corn	14	5.65±1.04	6.8x10^3±1.87	0.3x10±3.61	83.57±5.79	0
White corn	3	3.07±1.21	5.7x10^3±2.3	0	18.00±1.22	0
Wheat bran	12	10.8±1.60	1.4x10^4±4.22	0.8x10±1.32	2.5x10^2±0.97	1.7±1.2

Table (4): Frequency distribution and incidence percentages of pathogenic and potentially pathogenic isolates from poultry rations.

Isolates	Laying rations			Broiler rations			Over all frequency%	Over all Incidence %
	Isolate No.	Incidence %	Frequency .%	Isolates No.	Incid.%	Freq.%		
Staph.aureus	3	6.98	33.33	3	5.77	23.08	27.27	6.31
Staph. epidermidis	6	13.95	66.67	7	13.46	53.85	59.09	13.68
Strept.faecalis	4	9.30	44.44	4	7.69	30.77	36.36	8.42
Cl.perfringens	2	4.65	22.22	5	9.61	38.46	31.82	7.37
Ps. aeroginosa	3	6.98	33.33	3	5.77	23.08	27.27	6.31
Alcaligenes faecalis	2	4.65	22.22	2	3.85	15.38	18.18	4.21
Escherichia coli	5	11.63	55.55	4	7.69	30.77	40.91	9.47
Klebsiella pneumonae	1	2.32	11.11	1	1.92	7.69	9.09	2.10
K.rhinoscleromatis	1	2.32	11.11	1	1.92	7.69	9.09	2.10
Enterobacter cloecae	1	2.32	11.11	3	5.77	23.08	18.18	4.21
E.agglomerans	1	2.32	11.11	2	3.85	15.38	13.64	3.16
Serratia liquificans	1	2.32	11.11	1	1.92	7.69	9.09	2.10
S. rubidae	1	2.32	11.11	2	3.85	15.38	13.64	3.16
Proteus morganii	0	0	0	2	3.85	15.38	9.09	2.10
P. rettgeri	2	4.65	22.22	3	5.77	23.08	22.73	5.26
P. mirabilis	2	4.65	22.22	1	1.92	7.69	13.64	3.16
P. vulgaris	0	0	0	1	1.92	7.69	4.54	1.05
Providancia spp.	1	2.32	11.11	3	5.77	23.08	18.18	4.21
P. gondii	2	4.65	22.22	2	3.85	15.38	18.18	4.21
Citrobacter freundii	1	2.32	11.11	0	0	0	4.54	1.05
C. diversus	2	4.65	22.22	1	1.92	7.69	13.64	3.16
Hafnia spp.	2	4.65	22.22	1	1.92	7.69	13.64	3.16
Salmonella spp.	0	0	0	0	0	0	0	0

Table (5): Frequency distribution and incidence percentages of pathogenic and potentially pathogenic isolates from poultry concentrates.

Isolates	Layer concentrates			Broiler concentrates			Over all frequency%	Over all incidence%
	Isolates No.	Incidence %	Frequency %	Isolate No	Incidence %	Frequency %		
Staph.aureus	2	15.38	28.57	0	0	0	11.11	6.25
Staph. epidermidis	3	23.08	42.86	1	5.26	9.09	16.67	12.50
Strept.faecalis	0	0	0	0	0	0	0	0
Cl. perfringens	3	23.08	42.86	3	15.79	27.27	33.33	18.75
Ps. aeroginosa	0	0	0	2	10.53	18.18	11.11	6.25
Alcaligenes faecalis	2	15.38	28.57	3	15.79	27.27	27.78	15.62
Escherichia coli	0	0	0	0	0	0	0	0
Klebsiella pneumonae	0	0	0	0	0	0	0	0
K.rhinoscleromatis	0	0	0	0	0	0	0	0
Enterobacter cloecae	1	7.69	14.28	0	0	0	5.55	3.12
E.agglomerans	1	7.69	14.28	2	10.53	18.18	16.67	9.37
Serratia liquificans	0	0	0	0	0	0	0	0
S. rubidae	1	7.69	14.28	1	5.26	9.09	11.11	6.25
Proteus morganii	0	0	0	1	5.26	9.09	5.55	3.12
P. rettgeri	0	0	0	1	5.26	9.09	5.55	3.12
P. mirabilis	0	0	0	0	0	0	0	0
P. vulgaris	0	0	0	2	10.53	18.18	11.11	6.25
Providancia spp.	0	0	0	1	5.26	9.09	5.55	3.12
P. gondii	0	0	0	1	5.26	9.09	5.55	3.12
Citrobacter freundii	0	0	0	0	0	0	0	0
C. diversus	0	0	0	0	0	0	0	0
Hafnia spp.	0		0	1	5.26	9.09	5.55	3.12
Salmonella spp.	0	0	0	0	0	0	0	0

Table (6): Frequency distribution and incidence percentages of pathogenic and potentially pathogenic isolates from poultry feeds and feed ingredients.

Isolates	Soyabean meal			Yellow corn			White corn			Wheat bran				
	No. of Isolates	Incid. %	Freq. %	No. of isolates	Incid. %	Freq. %	No. of isolates	Incid. %	Freq. %	No. of isolates	Inc.%	Freq. %	Over all frquency%	Over all incidence %
Staph.aureus	5	13.16	38.46	3	12.50	21.43	1	8.33	33.33	3	6.38	25	28.57	9.92
Staph. epidermidis	6	15.79	46.15	5	20.83	35.71	2	16.67	66.67	6	12.76	50	45.24	15.70
Strept.faecalis	5	13.16	38.46	5	20.83	35.71	1	8.33	33.33	4	8.51	33.33	35.71	12.40
Cl.perfringens	0	0	0	0	0	0	0	0	0	3	6.38	25	7.14	2.48
Ps. aeroginosa	1	2.63	7.69	0	0	0	0	0	0	2	4.25	16.67	7.14	2.48
Alcaligenes faecalis	2	5.26	15.38	0	0	0	0	0	0	3	6.38	25	11.90	4.13
Escherichia coli	3	7.89	23.08	2	8.33	14.28	0	0	0	2	4.25	16.67	16.67	5.78
Klebsiella pneumonae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
K.rhinoscleromatis	1	2.63	7.69	0	0	0	1	8.33	33.33	1	2.13	8.33	7.14	2.48
Enterobacter cloecae	2	5.26	15.38	0	0	0	0	0	0	2	4.25	16.67	9.52	3.30
E.agglomerans	0	0	0	0	0	0	1	8.33	33.33	3	6.38	25	9.52	3.30
Serratia liquificans	0	0	0	0	0	0	0	0	0	1	2.13	8.33	2.38	0.83
S. rubidae	2	5.26	15.38	1	4.17	7.14	1	8.33	33.33	2	4.25	16.67	17.28	4.96
Proteus morganii	1	2.63	7.69	1	4.17	7.14	1	8.33	33.33	2	4.25	16.67	11.90	4.13
P. rettgeri	3	7.89	23.08	2	8.33	14.28	2	16.67	66.67	4	8.51	33.33	26.19	9.09
P. mirabilis	1	2.63	7.69	1	4.17	7.14	0	0	0	2	4.25	16.67	9.52	3.30
P. vulgaris	1	2.63	7.69	0	0	0	0	0	0	1	2.13	8.33	4.76	1.65
Providancia spp.	1	2.63	7.69	1	4.17	7.14	1	8.33	33.33	2	4.25	16.67	11.90	4.13
P. gondii	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Citrobacter freundii	2	5.26	15.38	1	4.17	7.14	0	0	0	2	4.25	16.67	11.90	4.13
C. diversus	1	2.63	7.69	2	8.33	14.28	1	8.33	33.33	1	2.13	8.33	11.90	4.13
Hafnia spp.	1	2.63	7.69	0	0	0	0	0	0	1	2.13	8.33	4.76	1.65
Salmonella spp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Table (7): Frequency distribution and incidence percentages of pathogenic and potentially pathogenic isolates from poultry feeds and feed ingredients.

Isolates	No. of isolates										
	Laying ration	Broiler ration	Conc. layer	Conc. broiler	Soyabean meal	Yellow corn	White corn	Wheat bran	T.isolates	T.over all incidence %	T. over all frequency %
Staph.aureus	3	3	2	0	5	3	1	3	20	8.06	24.39
Staph. epidermidis	6	7	3	1	6	5	2	6	36	14.52	43.90
Strept.faecalis	4	4	0	0	5	5	1	4	23	9.28	28.05
Cl.perfringens	2	5	3	3	0	0	0	3	16	6.45	19.51
Ps. aeroginosa	3	3	0	2	1	0	0	2	11	4.44	13.41
Alcaligenes faecalis	2	2	2	3	2	0	0	3	14	5.64	17.07
Escherichia coli	5	4	0	0	3	2	0	2	16	6.45	19.51
Klebsiella pneumonae	1	1	0	0	0	0	0	0	2	0.81	2.44
K.rhinoscleromatis	1	1	0	0	1	0	1	1	5	2.02	6.09
Enterobacter cloecae	1	3	1	0	2	0	0	2	9	3.63	10.97
E. agglomerans	1	2	1	2	0	0	1	3	10	4.03	12.19
Serratia liquificans	1	1	0	0	0	0	0	1	3	1.21	3.66
S. rubidae	1	2	1	1	2	1	1	2	11	4.44	13.41
Proteus morganii	0	2	0	1	1	1	1	2	8	3.22	9.76
P. rettgeri	2	3	0	1	3	2	2	4	17	6.85	20.73
P. mirabilis	2	1	0	0	1	1	0	2	7	2.82	8.54
P. vulgaris	0	1	0	2	1	0	0	1	5	2.02	6.09
Providancia spp.	1	3	0	1	1	1	1	2	10	4.03	12.19
P. gondii	2	2	0	1	0	0	0	0	5	2.02	6.09
Citrobacter freundii	1	0	0	0	2	1	0	2	6	2.42	7.38
C. diversus	2	1	0	0	1	2	1	1	8	3.22	9.76
Hafnia spp.	2	1	0	1	1	0	0	1	6	2.42	7.38
Salmonella spp.	0	0	0	0	0	0	0	0	0	0	0
Total	43	52	13	19	38	24	12	47	248	100	302.52