

## COMPARISON BETWEEN THE EFFICACY OF CHOSED MIXED HERBAL PRODUCTS (C.M.H.) AND CHEMICAL DRUG (DICIAZURIL) AGAINST COCCIDIOSIS IN CHICKENS

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### ABSTRACT

This study was carried out from June 2004 to June 2005 to study the possibility of utilization of natural herbal medicinal plants (C.M.H.) instead of chemical ones such as diclazuril to overcome the serious disease of coccidiosis in chickens in Egypt. Experiment was conducted in parasite section, National Research Centre, Giza – Egypt.

The effect of some mixed herbal products (C.M.H.) which contains mixed of herbs of *Artemisia annua* 50 %, Flaxseed 25 % and curcumin 25 % was studied for controlling the avian coccidiosis mainly (*Eimeria acervulina*, *E.maxima* and *E.tenella*) as compared with chemical medicine (diclazuril).

Some primary treatments have been carried out as different structures which mixed of some herbal plants to choose the best of them as superior natural herbal structure to overcome serious coccidiosis diseases and weight gain in chickens in Egypt. The best group of different structures mixed herbal products which one kg of product composed of *Artemisia annua* 500 gm, flaxseed 250 gm and curcuma longa 250 gm comparing with remain other structures. This choosed group of mixed herbal products used against coccidiosis in chickens in comparison between efficacy of this natural product and chemical drug (diclazuril).

**Six equal groups of chickens were used in this study, as follows:-**

- 1- First and second groups of chickens were treated with (C.M.H.) 1 and 2 kg. / ton of nutrition respectively from one day of life.
- 2- Third and fourth groups of chickens were treated with (C.M.H.) 3 Kg. / ton and 1 ppm of diclazuril, respectively, from first day of life until the end of experiment.
- 3- Last two groups of chickens 5 and 6 were left as positive and negative control.
- 4- At 14 days of life, the groups of chickens of 1, 2, 4 and 5 were infected by 50,000 sporulated oocyst / bird.

**Results of the experiment provided a promising results as followed :-**

- No mortalities were observed in chickens which treated by 2 Kg. / ton of (C.M.H.), followed by 4% and 8% mortalities in treatments with 1 kg / ton of (C.M.H.) and 1 ppm of diclazuril, respectively.
- Significant protection against lesion score ( against coccidial infection) was observed by treatment with 2 and 1 kg / ton of (C.M.H.), respectively – comparing with diclazuril at 1 ppm.
- Weight gain was reached 288.4 and 259 / g. in groups treated with 2 and 1 Kg of (C.M.H.) respectively, when 1 ppm of diclazuril reached to 267.1 gm / average weight gain against 227.3 g. in non – treated infected group.
- Flaching result was observed when 3 Kg / ton of (C.M.H.) was used in non – infected chickens, while average of weight gain was reached to 314.2 g. against 254.9 g. in non – infected non – treated group.

- Oocyst shedding per g. of faecal dropping was decreased in groups medicated with (C.M.H.) at 2 and 1 Kg / ton while it was reached to 678.7 and 1018.5 oocyst / g. respectively, if compared with chemical diclazuril, treated and non – treated groups ( 8459 and 30867.5 oocyst per g. ) , respectively .

This study showed that the use of (C.M.H.) gave a promising results in controlling of avian coccidiosis diseases Spp. especially *E.acervulina*, *E.maxima* and *E.Tenella*, beside, it obviousles improved body weight and weight gain reached to 26.9 % and 38.2 % ,when (C.M.H.) added to feed with 2 or 3 Kg / ton.

## INTRODUCTION

Avian coccidiosis is an intestinal disease caused by protozoan parasites of the genus *Eimeria* which replicate within the epithelial cells of intestine (Shirley, 1986). The disease has a great economic impact in poultry production. The annual worldwide cost is estimated at about \$ 800 million (Williams, 1998), however (Yun et al., 2000) reported that the annual losses reach to more than \$ 1.5 billion. These estimates include the costs of prophylactic in feeds medication for broiler and layer breeders.

Coccidial oocysts are ubiquitous and easily disseminated in the poultry house environment and have such a large reproduction potential, it is very difficult to keep chickens coccidian free, specially under current intensive rearing conditions. In spite of the improvement in management and hygienic conditions in poultry production in recent years, outbreaks of coccidiosis still occur.

The use of anticoccidial feed additives over the past 50 years has played a major role in the growth of poultry industry. These anticoccidials could be classified as (I) chemicals have specific mode of action against parasite metabolism such as amporolium and clopidol decoquinate and (II) polyether ionophore such as monensin, lasalocid and salinomycin which act through general mechanisms of altering ion transport and disrupting osmotic balance (Jeffers,1997). However, the development of anticoccidial resistance has threatened the economic stability of the poultry industry (Chapman, 1994 & 1998 and Ruff and Danfroth, 1966). Live vaccines for coccidiosis control have been used to a limited degree by the poultry industry for about 50 years. Their effectiveness depends on the recycling of initially doses of oocyst and gradual build up of solid immunity (Shirley et al., 1995) they had been used primarily to protect the breeder and layer flocks. In broilers the life vaccine required careful determination of the dose to avoid depressing effect on the growth performance (Abu-El Ezz et al., 2002).

Different types of substances had been investigated to search on the alternative method for controlling the coccidiosis. A number of natural products have been tested as anticoccidial dietary additives (Allen et al., 1998). Sources of fats containing of n-3 fatty acids (n-3 FA) such as fish oils, flaxseed oil and whole flaxseed, when added to starter rations from one day of age, effectively reduced lesions resulting from challenge with *E. tenella* but not *E. maxima* (Allen et al., 1996). Curcumin (0.05%), appear to be effective in reducing upper-and mid small intestinal infections caused by *E. acervulvna* and *E. maxima* (Allen et al., 1998), but not beneficial for *E. tenella* infections. Other traditional medicinal plants were applied by (Allen et al.,

1996 & 1997<sub>b</sub>), (Massoud *et al.*, 2004) and (Abu El-Ezz, 2005) for controlling coccidiosis in chickens.

The present work aimed to evaluate the effect of active principals,  $\alpha$ -linolenic acid, artemisinin and curcumin in herbs Flaxseed, *Artemisia annua* and Tumeric, respectively ; in combination for controlling the coccidiosis and weight gain in chickens as compared with diclazoril ; for final goal to use natural herbal products instead of chemical ones to protect the health of human and prevent environmental pollution . In addition , this work examines some documented alternative natural products that have shown some useful properties either by controlling *Eimeria* or through improving the animal's ability to resist the disease .

## MATERIALS AND METHODS

### Parasites :

Local field of mixed *Eimeria* species that infect different sections of the intestine mainly as *E. acervulina* (duodenum) *E. maxima* (mid part) and *E. tenella* (cecum) was used. Chickens were inoculated at age of 2 weeks with 50.000 sporulated oocysts/chicken.

The effective medicinal components of materials under studied have been analyzed and estimated in Chemistry Section laboratory of Mansoura Agriculture College.

Evaluation of medicinally active components of these spices are :

- 100 gm of *Artemisia annua* contains 0.600 gm of artemisinin.
- 100 gm of Flaxseed contains 19.25 gm of  $\alpha$ -linolenic acid.
- 100 gm of *Curcuma longa* contains 0.05 gm of curcumin.

### Edicaments :

(C.M.H.) contains the following ingredients per Kg :

- *Artemisia annua* 500 gm contains 3 gm of artemisinin.
- Flaxseed (250 gm) contains 48.125 of  $\alpha$ -linolenic acid.
- Tumeric (250 gm) contains 0.125 gm of curcumin.

### Experimental Design :

#### (1) Primary experiment

It was carried out to prefer the better of different combinations which they composed of three herbs at different amounts against coccidiosis diseases in chickens. These herbs are *Artemisia annua*, Flaxseed and Tumeric- and they are recognized as anti-parasites. The primary experiment contains five treatments and each of them included 50 chickens one day old.

Treatments contained :

- T1 : 1 kg/ton [*Artemisia annua* (A) + Flaxseed (F) + Tumeric (T)-500 + 250 + 250/gm] respectively. Inf. Treated.
- T2 : 1 kg/ton [A + F + T- 250 + 500 + 250/gm] respectively. Inf. Treated.
- T3 : 1 kg/ton [A + F + T- 250 + 250 + 500/gm] respectively. Inf. Treated.
- T4 : 1 kg/ton [A + F + T- 333.3 + 333.3 + 333.3/gm] respectively. Inf. Treated.
- T5 : 1 kg/ton [A + F + T- 500 + 250 + 250/gm] respectively. Inf. and non- Treated.

Inf. : Chicks infected with *Eimeria* of coccidiosis.

Treated : Addition of different mixtures of herbs with different doses to feed of chicks.

**(2)Chief experiment**

A total of 180 one-day-old egg laying chicks (Lohman) were used in the experiment. The chicks were divided into 6 groups (1-6) 30 chicks each. The birds were fed on starter ration free from anticoccidial drugs. First , second and third groups were treated with (C.M.H.) at the levels 1 , 2 and 3 kg / ton , respectively. Birds in group 4 were treated with (1ppm) diclazuril in ration. Groups number 5 & 6 were left as infected non treated and non infected non-treated control groups. At 14 days of age chicks in groups 1, 2, 4 and 5 were inoculated by 50000 sporulated oocysts of mixed *Eimeria* spp., but group (3) did not inoculated .

Measurements to evaluate the efficacy of (C.M.H.) as anticoccidial drug were; mortality rate; body weight; weight gain and lesion score at day 5 post infection (pi) (Johnson and Reid, 1970). The percentage of protection against mean lesion was calculated after (Singh and Gill, 1976). In addition, the total oocysts output/g. of fecal dropping were estimated for each infected group of chickens using Mac-Master slid technique (Gordon and Whitlock, 1939). Chicks were individually weighed at one-day-old, 2 weeks old (day of infection) and at the end of experiment. Statistical analyses were carried out by Duncan's multiple range test (Duncan, 1955) which used to detect the significant differences between means. The statistical design of experiment was complete randomized blocks, with three replicates .

## **RESULTS**

Data of primary experiment tabulated in Table (1), explained that, the first treatment , 1 kg of mixture contains 500 gm *Artemisia annu* + 250 Flaxseed + 250 gm Tumeric herbs, realized most achievement of superior results comparing with others. Differences were statistically significant comparing treatments with control in T5. So, mixture of T1 was choosed than others to start the chief experiment to compare between the efficacy of some mixed herbal products and chemical drug (diclazuril) against coccidiosis in chickens.

In chief experiment obtained results are represented in tables (2-4). As shown in Table (2), the mortality percentage in infected non treated group (G5) was reached to 24%, while it was 8% and 4% in chicks which medicated by diclazuril and (C.M.H.) 1 kg/ton in groups 4 and 1 respectively. No mortalities were recorded in chicks which received (C.M.H.) as 2 or 3 kg/ton. The protection against mean lesion score was reached to 75.75, 100 and 97.5% in chickens which medicated with diclazuril and (C.M.H.) 2 & 1 kg / ton respectively.

Regarding to lesion score in intestine it was found that there is a significant reduction in lesion score in the duodenum and cecum in all infected treated groups if compared with non treated one, while it was reached 1.000; zero and 1.000 in groups 1, 2 and 4 respectively. Results in Table (2) showed that a significant reduction in lesion score in groups 1 & 2 comparing with group 4. On the other hand, there is a significant protection against lesion score in group 4, if compared with group 5.

The comparative effect between (C.M.H.) and diclazuril on weight gain of coccidial infected chickens was clarified in Table (3). It was found that the addition of 2 kg/ton from (C.M.H.) (Gr<sub>2</sub>) gave a promising result; while the weight gain was reached 288.4 g. comparing with 259.0 g. when 1 kg/ton of (C.M.H.) was used (Gr<sub>1</sub>) and 267.1 g. when 1 ppm of diclazuril was used against 227.3 g. in infected non treated control group. A flashing result was shown when 3 kg/ton of (C.M.H.) was used in non infected chickens, while the weight gain reached 314.2 g. (Gr<sub>3</sub>) against 254.9 in non infected non treated control group (Gr<sub>0</sub>).

Results of body weight were clarified in Table (3). The body weight at 2 and 5 weeks was significantly increased in group (2) if compared with other infected treated groups. It reached 210 g. in Gr<sub>2</sub> against 200.3; 2.30 and 199.0 in group 1, 4 and 5 at day of infection respectively (Table 3). After 3 weeks post-infection (5 week old), there was a significant difference between all groups. In group 2 (C.M.H.) significantly protected weight gains. It reached 327.1 against 305.2 and 265.9 g. in diclazuril treated and nontreated groups, respectively comparing in non infected chicken groups.

The (C.M.H.) provided a significant mean body weight gain (352 g) in group 3 if compared with (293 g.) in non infected non treated control (group 6).

**Table (1) : Comparative effect of different herbal compounds and coccidial infection on mortality %, lesion scores, protection % and weight gains/gm in chicks.**

Measurements Treatments	Treated with herbs	Infection with Eimeria spp.	Mortality %	Lesion scores	Protection %	Weight gains/gm
T1	+	+	4.0	0.800 ± 0.430	97.25	259.0
T2	+	+	10.0	1.200 ± 0.673	82.62	250.6
T3	+	+	14.0	1.634 ± 0.576	78.66	246.1
T4	+	+	16.0	1.986 ± 0.646	74.39	240.8
T5	-	+	26.0	3.000 ± 0.574	26.00	227.3

- T1 : 1 kg/ton [Artemisia annu (A) + Flaxseed (F) + Tumeric (T)-500 + 250 + 250/gm] respectively. Inf. Treated.

- T2 : 1 kg/ton [A + F + T- 250 + 500 + 250/gm] respectively. Inf. Treated.

- T3 : 1 kg/ton [A + F + T- 250 + 250 + 500/gm] respectively. Inf. Treated.

- T4 : 1 kg/ton [A + F + T- 333.3 + 333.3 + 333.3/gm] respectively. Inf. Treated.

- T5 : 1 kg/ton [A + F + T- 500 + 250 + 250/gm] respectively. Inf. and non-treated.

Inf. : Chicks Infected with Eimeria of coccidiosis.

Treated : Addition of different mixtures of herbs with different doses to feed of chicks.

Result in table (4) showed the comparative effect , of dietary (C.M.H.) and diclazuril on output of *Eimeria* spp. Oocysts of faecal dropping in different chicks groups. It was found that the shedding of oocysts per g. of faecal dropping decreased in groups which medicated by (C.M.H.) ( 2 & 1 kg/ton) while it reached 678.7 and 1018.5 oocyst/g. respectively if compared with groups which medicated with diclazuril and nontreated group while it reached 8459 and 30867.5 oocyst/g. respectively. All results in treatments were compared with obtained in (Gr<sub>6</sub>).

Table (2): Effect of diets supplemented with (C.M.H.) or diclazuril on mortality, lesions score and protection percentages against lesion scores of chicken infected with *Eimeria* spp.

Gr No	Treatment	Infection with <i>Eimeria</i> spp.	Mort. %	Lesion scores				Prot %
				D <sup>2</sup>	M <sup>3</sup>	C <sup>4</sup>	Total mean	
1	Chicken fed C.M.H. 1 kg/ton	+	4	1.000 <sup>A</sup> ± 1.000	1.000 <sup>A</sup> ± 0.577	0.400 <sup>A</sup> ± 0.430	0.800 ± 0.669	97.25
2	Chicken fed C.M.H. 2 Kg/ton	+	0	0 <sup>A</sup>	0 <sup>A</sup>	0 <sup>A</sup>	0	100
3	Chicken fed C.M.H. 3 kg/ton	-	0	0 <sup>A</sup>	0 <sup>A</sup>	0 <sup>A</sup>	0	100
4	Chicken feed diclazuril 1ppm	+	8	1.000 <sup>B</sup> ± 0.577	1.333 <sup>B</sup> ± 0.666	0.666 <sup>A</sup> ± 0.666	0.998 ± 0.636	75.75
5	Chicken infected non-treated	+	24	3.000 <sup>B</sup> ± 0.577	3.000 <sup>B</sup> ± 0.573	3.000 <sup>B</sup> ± 0.577	3.000 ± 0.574	26.0
6	Chicken non infected non treated.	-	0	0 <sup>A</sup>	0 <sup>A</sup>	0 <sup>A</sup>	0	100

1. C.M.H.. : Choosed mixed herbal products .

2. D : Duodenum

3. M : Mid part of intestine.

4. C : Cecum.

5. Prot. : protection .

6. Mort. : Mortality %

7. Gr. : group .

Table (3) :Comparative effect of (C.M.H.), Diclazuril, and coccidial infection on chicken weight gain (g).

Gr No.	body weight (X+ S.E)			Total weight gain (gm)
	1 day old	2 wks. old (day of infection)	5 wks. old	
1	38.8 <sup>b</sup> ± 0.709	200.3 <sup>Bc</sup> ± 2.830	297.8 <sup>c</sup> ± 4.732	259.0
2	38.7 <sup>b</sup> ± 0.558	210.0 <sup>b</sup> ± 3.240	327.1 <sup>e</sup> ± 2.131	288.4
3	38.5 <sup>ab</sup> ± 0.281	230.0 <sup>e</sup> ± 5.773	352.7 <sup>f</sup> ± 4.164	314.2
4	38.1 <sup>a</sup> ± 0.460	203.0 <sup>c</sup> ± 2.211	305.2 <sup>d</sup> ± 3.293	267.1
5	38.6 <sup>ab</sup> ± 0.423	195.0 <sup>a</sup> ± 5.773	265.9 <sup>a</sup> ± 4.532	227.3
6	38.8 <sup>a</sup> ± 0.746	197.1 <sup>ab</sup> ± 4.724	293.7 <sup>b</sup> ± 2.626	254.9

A,B, C, D one Duncan grouping.

Different letters of means in the same column shown significant difference at p < 0.05.

Table (4): Comparative effects of dietary (C.M.H.) and diclazuril on *Eimeria* spp. oocyst (OPG) of faecal dropping in different groups of chicks.

DPI	Group	Mean oocyst count/gm (10 <sup>2</sup> ) of faeces					
		Gr1	Gr2	Gr3	Gr4	Gr5	Gr6
1-5		0	0	0	0	0	0
6		20	16	0	16	288.5	0
7		167	163	0	54	552	0
8		2795	2725	0	3051	8095	0
9		3130	2112	0	3105	6890	0
10		1385	760	0	1360	6532	0
11		849	474	0	536	4965	0
12		705	405	0	195	2630	0
13		648	37	0	52	430	0
14		336	26	0	49.5	296	0
15		150	69	0	41	189	0
Total		10185	6787	0	84595	308675	0
Mean		1018.5	678.7	0	8459.5	30867.5	0

DPI : day post infection .

## DISCUSSION

Coccidiosis is regarded as the parasitic disease that has the greatest economic impact on poultry production.

The increase resistance of avian coccidia to anticoccidial drugs currently used by the poultry industry has stimulated the search for new methods of control. In the last decades plant extracts were widely used for the controlling of avian coccidiosis and improving poultry performance world wide . (Mathis, 1995; Allen *et al.*, 1997a & 1997b; Allen *et al.*, 1996; Allen *et al.*, 1998; Allen *et al.*, 2000; Young and Noh ,2001; Massoud *et al.*, 2004 and Abu El-Ezz, 2005).

This study was planed to study the effect of (C.M.H.) as a mixed herbal products for controlling avian coccidian spp. mainly *E. acervulina*; *E. maxima* and *E. tenella*. Diets supplemented with (C.M.H.) from one day old until the end of experiment provided significant protection against lesion scores of coccidial infection (Table 2) and protect weight during infection with 50.000 oocyst from field strains of *Eimeria* (Table 3), as well as reducing the oocyst output of *Eimeria* in faecal dropping if compared with diclazuril 1 ppm or non infected non treated control group. The obtained results may be due to the effect of (C.M.H.) components and their chemical constituents for possible use as a prophylactic feed additives. Allen *et al.*, (1997<sub>a</sub>) found that, when fed over a period of 3 weeks at a level of 5%, a dried leaf supplement of *A. annua* produced significant protection against lesions due to *Eimeria tenella* but not *Eimeria acervulina* or *Eimeria maxima*. Artemisinin is isolated from *Artemisia annua*; it is naturally occurring endoperoxide with antimalarial properties (Allen *et al.*, 1997<sub>b</sub>). It has been effective in reducing oocyst out put from both *E. acervulina* and *Eimeria tenella* infections when fed at levels of 8.5 and 17 ppm in starter diets (Allen *et al.*, 1997<sub>a</sub> and <sub>b</sub>). The mode of action of artemisinin has been attributed both to its potential to induce a state of oxidative stress through the free radical cascade generated by the endoperoxide function (Krungknai and Yuthovong, 1987; Levander *et al.*,

1989; Meshniok et al., 1989), and to the ability of the free radical to alkylate protein (Yang et al., 1994).

Our results in Table (2) were agree with the finding of (Allen et al., 1998) they found that curcumin (0.05%), appear to be effective in reducing upper-mid and small intestinal infection, caused by *E. acervulina* and *E. maxima*. The medicinally active component, curcumin, a phenolic compound shown to have antioxidant and anti-inflammatory properties .

Regarding to the role of flaxseed in controlling of coccidiosis in chickens; several investigators (Fawcett et al., 1989; Levander et al., 1993) have shown that feeding diets high in n-3 fatty acids (n-3FA) is protective against protozoan infection due to oxidative stress induced by oxidation of the highly unsaturated fatty acids that had been incorporated into host tissues and cells of the parasite. Diets supplemented with n-3FA from menhaden oil and expressed flaxseed oil when fed to broiler from one-day-of age through 3 week will significantly reduce cecal lesion caused by *E. tenella* through reduction the development of parasite within the cecal mucosa (Allen et al., 1996 and 1998).

## RECOMMENDATION

It can be concluded that the use of (C.M.H.) had a promising result and field trials must be undertaken for confirmation these results. Breeders of poultry can use (C.M.H.) as a natural medicine to prevent coccidiosis disease in poultry and to cause increasing of weight gains 13.14 % and 23.26 % when it was added with 2 and 3 Kg / ton to feed , respectively . Authers suggest to call choosed mixed herbal group (C.M.H.) – COX.HERB.SHAN.

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### مقارنة تأثير مخلوط بعض النباتات الطبية والمركب الكيماوي (الديكلزوريل) على طفيل الكوكسيديا في الدواجن

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- ١- مركز البحوث الزراعية - معهد بحوث البساتين - قسم بحوث النباتات الطبية والعطرية .
- ٢- المركز القومي للبحوث - قسم الطفيليات و أمراض الحيوان .

تم إجراء البحث بقسم الطفيليات وأمراض الحيوان بالمركز القومي للبحوث بالسديني - القاهرة في الفترة من يونيو ٢٠٠٤ حتى يونيو ٢٠٠٥ وذلك لدراسة تأثير خليط من أعشاب الأرتيميزيا أنيو بنسبة ٥٠% و بنز الكتان ٢٥% والكرم ٢٥% ومقارنة مع الدواء الكيماوي الشائع الإستعمال و المعروف باسم الديكلزوريل على مقاومة الإصابة بمرات مرض الكوكسيديا الطفيلي المتواجدة حقلًا وأهمها إيميريا أسيرفيولينا وإيميريا ماكسيما وكذلك إيميريا تينيللا والتي لها آثار سلبية خطيرة على الثروة الداجنة في جميع أنحاء العالم .

وأجريت الدراسة على ستة مجموعات من الطيور حيث تمت المعاملات كالاتي :

المجموعة الأولى : تلقت علاج مخلوط الأعشاب بمعدل ١ كجم / طن العلف من عمر يوم + عدوي صناعية في عمر ١٤ يوم .

المجموعة الثانية : تلقت علاج مخلوط الأعشاب بمعدل ٢ كجم / طن العلف من عمر يوم + عدوي صناعية في عمر ١٤ يوم .

المجموعة الثالثة : تلقت علاج مخلوط الأعشاب بمعدل ٣ كجم / طن العلف من عمر يوم + بدون عدوي

المجموعة الرابعة : تلقت علاج ديكلزوريل بتركيز ١ جزء في المليون من عمر يوم + عدوي صناعية في عمر ١٤ يوم .

المجموعة الخامسة : تركت بدون علاج طبيعي أو كيماوي + عدوي صناعية في عمر ١٤ يوم .

المجموعة السادسة : تركت بدون علاج طبيعي أو كيماوي و بدون عدوي .

وقد تمت العدوي الصناعية في عمر ١٤ يوم للمجموعات ١، ٢، ٤، ٥ بعدد ٥٠ ألف حويصلة ناضجة / طائر من حويصلات الأيميريا التي تم عزلها من الحقل بينما تركت المجموعات ٣، ٦ بدون عدوي .

وقد تم تقييم تأثير العلاج وفقاً لمعايير مختلفة و هي النسبة المئوية للنفوق ، متوسط وزن الطائر بالجرام ، الزيادة في الوزن ، التأثير الممرض و هي Lesion score وكذلك عدد الحويصلات التي تنزل في كل ١ جرام من زرق الطيور التي تمت عدواها و ذلك مقارنة بالمجموعات الضابطة ، و قد بينت النتائج ما يلي :

أولاً : لم يحدث أي نفوق في المجموعة الثانية التي تلقت علاج مخلوط الأعشاب بمعدل ٢ كجم/طن العلف بينما بلغ معدل النفوق ٤ % في المجموعة الأولى التي تلقت علاج مخلوط الأعشاب بمعدل ١ كجم / طن العلف و بلغ ٨ % في المجموعة الرابعة التي عولجت بالديكلزوريل و ذلك بمقارنتها بـ ٢٤ % نفوق في المجموعة التي تمت عدواها صناعياً ولم تعالج .

ثانياً : بلغت نسبة الحماية من الآثار الممرضة Lesion score ١٠٠ % في المجموعة الثانية التي عولجت بـ ٢ كجم/طن العلف و ٩٧,٥ % في المجموعة الأولى التي عولجت بـ ١ كجم / طن العلف من مخلوط الأعشاب مقارنة بـ ٧٥,٧٥ % في المجموعة الرابعة التي عولجت بالديكلزوريل بينما كانت نسبة الحماية ٢٦ % في المجموعة الخامسة التي لم تعالج.

ثالثاً : سجلت المجموعة الثالثة أعلى نسبة مئوية في زيادة الوزن حيث بلغ معدل الزيادة ٣٨,٢ % و ذلك عند إضافة ٣ كجم مخلوط الأعشاب / طن العلف تلاها ٢٦,٩ % عند إضافة ٢ كجم مخلوط الأعشاب / طن علف وبلغ معدل الزيادة ١٧,٥ % في المجموعة الرابعة التي تم علاجها بالديكلزوريل وكانت الزيادة ١٣,٩ % في المجموعة الأولى عند إضافة ١ كجم مخلوط الأعشاب /طن علف و ذلك عند مقارنة المجموعات المذكورة بالمجموعة الخامسة التي تم عدواها صناعياً ولم تأخذ أي نوع من العلاج .

رابعاً : لوحظ إنخفاض كبير في معدل نزول الحويصلات في براز الدجاج حيث كان ترتيبه كالاتي في كل جرام من البراز :

- صفر في المجموعة الثالثة ( ٣ ك مخلوط الأعشاب / طن ) و لم يتم عدواها .
- ٦٧٨,٧ حويصلة في المجموعة الثانية ( ٢ ك مخلوط الأعشاب / طن ) + عدوي صناعية .
- ١٠١٨,٥ حويصلة في المجموعة الأولى ( ١ ك مخلوط الأعشاب / طن ) + عدوي صناعية .
- ٨٤٥٩,٥ حويصلة في المجموعة الرابعة ( التي تم علاجها بالديكلزوريل ١ جزء في المليون ) + عدوي صناعية .

- ٣٠٨٦٧,٥ حويصلة في المجموعة الخامسة ( التي تم عدواها صناعياً ولم تتلقى أي علاج ) .  
وقد إنتهت الدراسة إلى إقتراح تسمية مخلوط الأعشاب المستعمل باسم كوكس هيرب هيرب شان) بتركيز ٢ك/طن علف كمنتج طبيعي وليس كيماوي يؤدي إلى القضاء على مرض الكوكسيديا بنسبة ١٠٠ % وقائياً و علاجياً على المستويين القومي والعالمي كما يؤدي إلى زيادة كبيرة في معدل أوزان الدجاج الأمر الذي يعود بالربح الوفير على المربي كما يحافظ على صحة الإنسان الذي يتناول دجاج معالج بالأعشاب الطبية الآمنة وخالية من الكيماويات كما أنه يضمن بيئة خالية من التلوث .