RESEARCH OPINIONS IN ANIMAL & VETERINARY SCIENCES
ISSN 2221-1896
www.roavs.com

Comparative efficacy of different schedules of administration of medicinal plants infusion on hematology and serum biochemistry of broiler chicks

Sajid ur Rehman[1], F.R Durrani[1], Naila Chand[1], Rifat Ullah Khan[2] and Fawad ur Rehman[3]

[1]Department of Poultry Science, Faculty of Animal Husbandry and Veterinary Sciences, NWFP Agricultural University Peshawar, Pakistan
[2]Department of Physiology and Pharmacology, University of Agriculture, Faisalabad, Pakistan
[3]Department of Livestock, Faculty of Animal Husbandry and Veterinary Sciences, NWFP Agricultural University, Peshawar; Pakistan

Abstract

The research study was undertaken to investigate the effect of different schedules of administration of medicinal plants infusion of aloe vera gel, barbery, garlic and ginger on hematology and serum biochemistry of broilers chicks. For this purpose 240, day old broilers chick (A) purchased were from a local dealer, divided in to four groups A, B, C and D and reared in separate pens for 35 days in an open sided house. These groups were divided into two vaccinated and non-vaccinated sub-groups for the different treatments. Each sub group was carrying three replicate (10 chicks/replicate). Group A was kept as control, while B, C and D were given infusion @ 10 ml/lit of water. The schedule was designated as the group B received infusion at alternate day, group C received infusion on alternate three days in a week and group D received infusion at alternate week. Relevant data was recorded throughout the experiment till the termination of experiment. Significant increase in hemoglobin concentration, PCV and total leukocyte count (TLC) was observed in group C. Significant reduction was recorded in ALT and ALP in group B, while AST and serum glucose in group C and increased in serum protein was found in group B. Decreased ($p<0.05$) total cholesterol, triglyceride, LDL, VLDL, and increased HDL ($p<0.05$) were experienced in group B. Comparing the values of risk ratio of, VLDL to HDL, Total cholesterol to HDL and LDL to HDL were found significantly lower in group B, while total cholesterol to VLDL was found significantly lower in group C. It is concluded that schedule on the basis receiving infusion three days in a week is more potent than other schedule of research study.

Keywords: Broiler, Schedule Based Administration, Hematology, Lipid Profile, Liver Function Test

Introduction

Poultry production has been improved significantly in the last three decades and plays a vital role in the economy of Pakistan. The provision of quality protein in the shortest period of time in the form of meat and eggs is the major contributing role of poultry birds in human nutrition. This is only possible when birds are provided quality feed and hygienic environment. Antibiotic and other feed additives are frequently given in feed as well as in drinking water to achieve the targeted nutritional and health status of the birds. The frequent use of drugs as feed additives in poultry ration resulted in resistant to pathogenic microorganism, affecting the feed efficiency and growth performance of poultry birds.
The consumption and demand for medicinal plants have been adopted in many countries because of low-cost, easy availability, affordability for a common farmer, good antimicrobial natured, reduced diseases associated risks, lowering blood cholesterol level and diversified functions in improving performance, growth rate, feed conversion rate and weight gain in birds (Lewis et al., 2003). Medicinal plants are used in pharmaceuticals, neutraceuticals, cosmetics, and food supplements and even as traditional source of medicines because of their antitumer, antiarthritic and antithrombotic functions (Thomson and Ali, 2003). Furthermore, scientists and researchers are trying to combat against fatal diseases in poultry through the use of medicinal plants, containing the most active ingredients to promote growth, weight gain, and immunostimulant.

Allium sativum (Garlic) is grown in many areas throughout the world and is considered by herbalists to be one of the most essential and useful herbs used for medicinal purposes. Various cultures have benefited from using garlic in medicines and foods for centuries. Garlic has been used for many years to prevent health problems

including colds, flu, menstrual pain, high blood pressure, coughs, gastrointestinal problems, atherosclerosis, and bronchitis. Garlic has been proven to kill various fungal infections, viruses, bacteria, and intestinal parasites (Elnima et al., 1983; Zenner et al., 2003).

Berberry (*Berberis lycium*) is a deciduous shrub growing up to 4 m high and belong to the family Berberidaceae. Its most potent agent is berberine, which is also known to have a number of therapeutical effects. Previous research has shown that berberry is helpful in increasing immune response (Abidi et al., 2006). Küpeli et al. (2002) has also reported that the extracts obtained from the roots and barks of various Berberis species are used as folk remedy worldwide for the treatment of various inflammatory ailments including lumbago, rheumatism and to reduce fever (antipyritic).

Aloe vera (*Alovera berbedinesis*) is a well documented medicinal plant in the literature, abundantly found in southern districts of NWFP. Aloe plants have pod like leaves, consist of two parts gel and latex. Most prominent monosaccharide in aloe vera gel is mannose-6-phosphate and most common polysaccharide, called gluco-mannans (beta 104 acetylated mannan). Active components of aloe vera plant are acids (glutaminic, aspartic, aloetic, formic, palmitic, estearic and ascorbic), essential oils (cineole, cariofilene and pinene), minerals (calcium, magnesium, potassium, zinc, phosphorus, manganese and aluminium), amino acids (aloin, aloesin, arginine, barbaloin, glycine, glutamine, histidine and serine. Aloe vera gel possesses anti-inflammatory activity (Udupa, 1994). Aloe gel heals lesions, created by coccidian parasites on the intestinal Wall and could effectively control Coccidiosis. Aloe vera gel also inhibits antiviral (Saoo, 1996), antiulcer and antidiabetic (Koo, 1994) and anticancer properties (Jeong, 1994).

Ginger (*Zingiber officinale*) is an herb indigenous to southeastern Asia. It is cultivated in U.S, India, china, West Indies and tropical regions of Pakistan. Ginger contain 44 constituents mostly Zingebirine, beta sisquiphellandrence and terinole, and contains various amount of nutrients such as protein, lipids and minerals. Ginger has been used as anti-microbial agent (Mascolo et al., 1989).

Keeping in view the effectiveness and significant importance of medicinal plants mixture of (aloe vera, ginger, garlic and barbery) with different administration schedule was used in broiler production to investigate the lipid profile of blood serum, hepatoprotective effect and hematological parameter.

Materials and Methods

Two hundred and forty day old Chicks were assigned to different treatment using complete randomized design. These chicks were alienated into four treatment groups A, B, C and D. Chicks were reared in an open sided house in pens. Feeder, drinker, bulb and other necessary materials were provided to chicks in each pen to maintain sound managemental and environmental conditions. Experiment was lasted for 35 days. The basal composition of feed is given in Table.1 The infusion was prepared from the different plants (garlic, barbary, aloe vera and ginger) with a known quantity already tested in a series of experiments conducted at poultry unit, NWFP Agricultural University Peshawar, Pakistan. To prepare the infusion from these plants the concentration of ginger and garlic contained 6 and 4 gm per liter respectively while barbery and aloe vera gel were present at the rate of 10 gm per liter of water infusion. Group A was kept as control while, B, C and D was given infusion @ 10 ml/lit of water. The schedule was fixed as group B received infusion at alternate day, group C received infusion three days in a week and group D received infusion at alternate week.

At the end of the experimental period, 20 birds per group were randomly selected. Blood samples from each bird were obtained by cervical dislocation. Two test tubes were prepared for each sample, one containing EDTA for hematological study and another for serum biochemistry. To get serum blood without EDTA was centrifuged at 1500 rpm for 20 minutes. Serum was aspirated by micropipette into sterile ependorphs and stored at -20°C until analysis.

Blood samples (3-5ml) with anticoagulant (EDTA) were collected from wing vein at the end of experiment. Blood samples were analyzed for hematological parameter including hemoglobin (Hb) concentration , packed cell volume (PCV), Total leukocytes count (TLC) and differential leukocyte counts by the method recorded by (Benjamin, 1978).

For the quantitative measurement of glucose in serum, commercially available kit BIORAY CAT # 1426-6 was used. For the quantitative determination of AST and ALT, ALP and serum protein in the serum commercially available kit by RANDOX were used. Lipid profile including total cholesterol to HDL ratio, LDL to HDL ratio, total cholesterol to VLDL ratio and VLDL to HDL ratio were determination using Elitech Kit technique as described by Werner et al. (1981).

Statistical Analysis

The data was statistically analyzed using standard procedure of analysis of variance as described by Steel

Table 1: Ingredients and composition of basal diet (as fed bases)

Ingredients (g/kg of diet)	Starter	Grower	Finisher
Maize, yellow	354.0	329.0	250.0
Soybean meal (480 g CP/Kg)	275.0	205.0	170.0
Sunflower meal 350 g CP/Kg)	110.0	151.0	110.5
Wheat	99.0	130.5	331.0
Wheat bran	-	37.0	-
Meat-bone meal	65.0	55.5	49.5
Vegetable oil	73.9	85.5	73.5
Limestone	13.5	-	-
Mineral-vitamins premix[1]	3.5	3.1	3.5
Sodium chloride	3.1	2.5	2.5
L-lysine	0.4	-	0.1
DL-Methionine	1.6	0.1	1.7
Calculated chemical composition (per Kg of diet)			
ME (MJ)	13.2	13.4	13.4
Crude Protein (g)	231.2	212.0	189.8
Calcium (g)	15.0	9.0	8.0
Available phosphorus (g)	5.0	4.7	3.9
Lysine (g)	12.0	10.0	8.5
Methionine (g)	5.6	4.0	5.2
Methionine + cysteine (g)	9.3	7.6	8.4
Sodium chloride (g)	3.4	2.9	2.9

[1]Provides per kg of diet: Mn 80 mg; Zn 60 mg; Fe 60 mg; Iron 5mg; Cu 5 mg; Co 0.2 mg; I 1 mg; Se 0.15 mg; choline chloride 200 mg; vitamin A 12 000 IU; vitamin D3 2 400 IU; vitamin E 50 mg; vitamin K3 4 mg; vitamin B1 3 mg; vitamin B2 6 mg; niacin 25 mg; calcium-d- pantothenate 10 mg; vitamin B6 5 mg; vitamin B12 0.03 mg; d-biotin 0.05 mg; folic acid 1 mg

and Torrie (1981). The statistical package (SAS 1988) was used to perform the data analysis.

Results and Discussion

The research study was conducted to investigate the effect of different schedule of administration of medicinal plants (aloe vera gel, garlic, barbery and ginger) infusion on, lipid profile, serum glucose, hematological and liver enzyme of broiler chicks. Means Hemoglobin estimation (Hb) level is presented in (Table 2). Group C receiving water based infusion three days a week, showed higher ($P<0.05$) Hb level (9.35 g/dl) as compared to other groups. The findings of the present research study are similar with the findings of Esonu et al. (2006), who observed significant increase in Hb level while feeding herbal plant (neem) to the laying hen. Results of our findings is in contrast with the findings of Gautam et al. (2004), who noticed that no significant effect on Hb was observed, fed *Withania somnifera* to the animals. Our result is in agreement with the result of Sham et al. (2003), who reported significant effect on hemoglobin and red cell count, while feeding *Withania somnifera* to animals. Means PCV level is presented in (Table 2). Group C receiving water based infusion three days a week showed higher PCV (39.50 %) level. This is parallel to the findings of Esonu et al. (2006), who reported significant increase in PCV level, in layers fed herbal plant neem. Means total leukocytes count (TLC) level is presented in table 2. Group C receiving infusion three days in a week showed higher TLC level. The findings of the present research study are parallel to the findings of Esonu *et al.* (2006), who observed significant increase in TLC level, while feeding herbal plant (neem) to the laying Hen. Finding of present study is in disagreement with the findings of Gautam et al. (2004), who noticed that no significant effect on lymphocyte and WBC counts was observed, while feeding *Withania somnifera* to the animals. Our result can also be comparable with the findings of Sham et al. (2003), who reported significant increase in white cell counts while feeding *Withania somnifera* to the mice. Means of Serum glucose level are presented in table 3. Significant ($P<0.05$) difference was observed in the mean serum glucose levels among the treated groups. Group C receiving infusion three days in a week was observed with the lowest significant value. The results of present study are in agreement with the results of Hemalatha (2004), who reported that administration of *Withania somnifera* significantly lowered the blood sugar. Findings of our study agree with the result of Sarika et al. (2006) who reported significant ($P<0.05$) decrease in blood glucose, while feeding of *Withania*

Table 2: Mean±SE hemoglobin (Hb), packed cell volume (PCV) total leucocytes count (TLC) in broiler chicks dosed with medicinal plants infusion (garlic, ginger, berberine, aloe vera) at different schedules

Parameters	A	B	C	D
Hb (mg/dL)	6.06±0.09[b]	6.38±0.08[b]	9.35±0.12[a]	5.08±0.09[b]
PCV (%)	24.00±4.23[b]	32.00±3.54[b]	39.50±3.42[a]	25.33±2.34[b]
TLC (10^3/mL)	20.16±1.23[b]	23.50±1.54[b]	28.83±3.21[a]	19.33±1.56[b]

Mean in the rows with different superscripts are significantly different at (P<0.05); Control: A, alternate day: B, alternate 3 days: C, alternate week: D

Table 3: Mean±SE glucose alanine transaminase (ALT), aspartate transaminase (AST), alkaline phosphatase (ALP) and serum protein (g/DL) in broiler chicks dosed with medicinal plants infusion (garlic, ginger, berberine, aloe vera) at different schedules

Parameters	A	B	C	D
Glucose (mg/dL)	100.32±2.35[a]	91.45±3.45[b]	80±4.54[c]	99.34±2.33[a]
ALT (U/L)	36.33±2.32[a]	16.16±2.31[c]	24.50±1.87[b]	39.33±1.34[a]
AST (U/L)	32.83±1.87[a]	16.33±1.09[b]	15.16±2.13[c]	31.50±2.76[a]
ALP (Unit/L)	2627.33±76.45[a]	1268.33±345.65[d]	1544.50±78.54[c]	2268.00±79.84[a]
Serum Protein (g/dL)	3.28±2.34[c]	7.86±1.34[a]	7.56±1.35[a]	3.88±1.25[b]

Mean in the rows with different superscripts are significantly different at (P<0.05); Control: A, alternate day: B, alternate 3 days: C, alternate week: D

somnifera extract to the albino rats. Result of our findings could be of relevance to the result of Andallu and Radhika (2000), who reported significant (P<0.05) lower serum glucose in the hyperglycemic rats, while feeding Withania somnifera extract to the mice. Findings of present study are related to the findings of Parihar et al. (2003), who reported that dietary supplementation of combination of *Withania somnifera* and aloe vera to diabetic mice produced a significant decline in plasma glucose concentration. The finding of present study is in contrast to the Mehrdad et al. (2006), who reported no significant hypoglycemic effect in treated, control and diabetic groups, while feeding of *Withania somnifera* extract to the animals.

Means Alanine Aminotransferase (ALT), aspartate transaminase (AST), alkaline phosphatase (ALP) and serum protein (g/DL) level for different groups A, B, C and D are presented in table 2. Significant (P<0.05) difference was fond in the mean ALT levels among the treatments. The group B receiving infusion on alternate day basis was observed the lowest numerical. The results of present study are in agreement with the results of Sudhir et al. (1986), who reported that alcoholic extract of leaves of *withania somnifera* has protective effect against the hepatotoxicity in rats. Mean serum ALP (alkaline phosphatase) value per chick at the end of experiment is presented in table 3. The ALP data was subjected to analysis of variance which revealed significant (P<0.05) difference among the groups. Significantly (P<0.05) reduced ALP was recorded in group B receiving infusion on alternate day as compared to the other groups. The results of present study are in agreement with the results of Choi (2005), who fed *Carum copticum* derived glabridin to mouse and found a significant elevation of alkaline phosphatase (ALP) activity. Thyagarajan et al. (2002), who reported that *Glycyrrhiza glabra* has been shown to be hepatoprotective and capable of inducing an indigenous interferon. Average serum AST (aspartate aminotransferase) value per chick at the end of experiment is presented in table 2. The AST data revealed significant (P<0.05) difference among the groups. AST was significantly (P<0.05) reduced in group C, receiving infusion three days a week as compared with other groups.

Significant (P<0.05) differences in the mean serum total cholesterol and triglyceride values were recorded among the treatments presented in (Table 4). Group C, receiving infusion three days a week was observed with the lowest numerical values of cholesterol, while group B receiving infusion at alternate day was observed with the lowest numerical value of triglyceride. Our findings are supported the observation of and Jayant and Dhuley (1997), who reported that ashwagandha (*Withania somnifera*) prevented the rise in LPO in rabbit and mice and Babu et al. (1997), who fed herbal plant to diabetic rats and found low value of serum cholesterol and serum triglyceride. Result of our findings are comparable with the findings of Nishant et al. (2006), who reported that Withania somnifera significantly (P<0.05) lowered the cholesterol in hypercholesteremic male albino rats. Result of our findings are relevant to the result of Andallu and Radhika (2000), who reported significant decrease in cholesterol and triglycerides in hyperlipidemic rats, while feeding *Withania somnifera* extract to the mice. Significantly higher (P<0.05) high density lipoprotein

Table 4: Mean (mg/dl#SE), total cholesterol, triglyceride, LDL (low density lipoprotein) , HDL (high density lipoprotein) , VLDL (very low density lipoprotein) ,total cholesterol to HDL ratio , LDL to HDL ratio ,Total cholesterol to VLDL ratio and VLDL to HDL ratio in broiler chicks through administration of medicinal plants infusion (garlic, ginger, berberine, aloe vera) at different schedules

Parameters (mg/dl)	A	B	C	D
Total cholesterol	250.00±5.43^{a}	150.50±2.34^{b}	143.83±4.35^{b}	236.16±4.32^{a}
Triglyceride	250.166±3.45^{a}	149.33±5.46^{b}	151.33±6.75^{b}	247.16±3.23^{a}
LDL	121.33±3.76^{a}	57.16±1.78^{c}	70.50±1.67^{b}	126.0±1.3^{a}
HDL	33.33±3.87^{c}	72.16±1.23^{a}	55.50±1.54^{b}	36.83±1.67^{c}
VLDL	95.3±2.54±1.53^{a}	33.16±1.25^{b}	27.50±1.54^{c}	73.33±2.46^{a}
Total cholesterol/ HDL	4.64±2.65±0.32^{a}	1.80±0.43^{c}	2.28±0.23^{b}	4.52±0.12^{a}
LDL/HDL	3.64±1.78±0.23^{a}	0.80±0.43^{c}	1.28±0.1.1^{b}	3.52±0.32^{a}
Total cholesterol/ VLDL	8.6316±2.65±0.08^{a}	2.7216±0.09^{c}	2.4100±0.11^{c}	4.8733±0.32^{b}
VLDL/ HDL	2.96±4.36±0.06^{a}	0.46±0.87^{c}	0.52±0.54^{b}	2.04±0.98^{a}

Mean in the rows with different superscripts are significantly different at (P<0.05).
Control: A, alternate day: B, alternate 3 days: C, alternate week: D

(HDL) values were observed in group B than control group (Table 4). Result of our findings are opposed by the findings of Nishant et al. (2006), who reported that Withania somnifera significantly (P<0.05) increased the HDL in hypercholesteremic male albino rats. Our findings agree with the result of Andallu and Radhika (2000), who reported that significant decrease in the HDL in hyperlipidemic rats fed Withania somnifera extract. Mean serum low-density lipoprotein (LDL) values were found significant (P<0.05) among the treatments presented in (Table 4). Significantly (P<0.05) lower serum low-density lipoprotein value was recorded in treatment B than control. The results of present study are in agreement with result of Babu et al. (2007), who fed herbal plant, cur cumin to diabetic rats and found low values of serum LDL. The results of present study are in agreement with result of Abidi et al. (2006)

Significantly lower (P<0.05) very low density lipoproteins (VLDL) values were observed in group C than control group (Table 4). The ratio was found lower in group C receiving infusion three days in a week, it seem to be lower chance of heart problem in group C following the group B receiving infusion on alternate day. Therefore, it's suggested that the infusion at the rate of 10 ml/liter should be used continuously without any more gap of days. Petit et al. 1993 conducted the research on Wister rats and observed that increase in plasma insulin and a decrease in total cholesterol and very low–density lipoprotein (VLDL) and low density lipoprotein (LDL).

Significantly lower (P<0.05) total cholesterol to HDL ratio and LDL to HDL ratio were observed in group B than control group (Table 4). The ratio was found lower in group B receiving infusion on alternate day, it seems to be lowered chance of heart problem in group B, and following group C received infusion after every three days in a week. It means that continuous use of the infusion of medicinal plants (aloe vera, garlic, ginger and barbery) had significantly reduced the chance of heart problems as compared to group D received infusion on alternate week. Result of our findings are comparable with the findings of Petit et al. (1993) conducted the research on Wister rats and observed that increase in plasma insulin and a decrease in total cholesterol and very low–density lipoprotein (VLDL) and low density lipoprotein (LDL). No other relevant literature is available on the ratio of total cholesterol to HDL and LDL to HDL ratio.

Significantly lower (P<0.05) Total cholesterol to VLDL ratio was observed in group C and VLDL to HDL ratio was significantly lower in group B. (Table 4). The ratio was found higher in group C receiving infusion three days in a week, it seems to be lowered chance of heart problem in group C following the group B receiving infusion on alternate day. It means that continues use of the infusion of medicinal plants (aloe vera, garlic, ginger and barbery) had significantly reduced the chance of heart problems as compared to the group D that receiving infusion on alternate week. Result of our findings are comparable with the finding of Petit et al. (1993) conducted the research on Wister rats and observed that increase in plasma insulin and a decrease in total cholesterol and very low–density lipoprotein (VLDL) and low density lipoprotein (LDL). No other relevant literature is available on the total cholesterol to VLDL ratio and VLDL to HDL ratio.

The present research study was undertaken to investigate the effect of different schedule of administration of medicinal plants of water based infusion of aloe vera gel, barbery, garlic and ginger on, hematological parameters, lipid profile, serum glucose level, total protein and liver function tests of broilers. Water based infusion of Aloe vera gel, Barbery, Garlic

and Ginger had significant effect on hemoglobin concentration, PCV and TLC of the broilers in group C. Similarly, a significant effect of water based infusion of Aloe vera gel, Barbery, Garlic and Ginger was established on AST, cholesterol, triglyceride, serum glucose, VLDL and cholesterol to VLDL ratio, in broiler's blood in group C. However, the water based infusion of aloe vera gel, barbery, garlic and ginger had significantly influenced the ALP, serum protein, VLDL to HDL ratio, LDL, HDL, cholesterol to HDL ratio, LDL to HDL ratio and number of oocysts of broiler in group B.

References

Abidi, P., Chen, W., Kraemer, F.B., Li, H. and Liu, J. 2006. The medicinal plant goldenseal is a natural LDL-lowering agent with multiple bioactive components and new action mechanisms. *Journal Lipid of Research*, 47: 2134-2147.

Andallu, B. and Radhika, B. 2000. Hypoglycemic, diuretic and hypocholesterolemic effect of winter cherry (Withania somnifera, Dunal) root. *Indian Journal of Experimental Biology*, 38:607-609.

Babu, P.S.and Sirivansan, K. 1997. Hypolipidimic action of curcumin, the active principle of turmeric (*Curcumia longa*) in straptozotocin induced diabetic rats. *Mollecular and Cellular Biochemistry*, 166: 169-175.

Benjamin, M. 1978. Outline of vet, clinical pathology 3rd Ed. The lowa state Uni. Press. Lowa., USA.

Chang, H.W. 1995. Antibacterial effect of spices and vegetables. *Journal of Food Industries*, 27:53-61

Choi, E.M. 2005. The liquorice root derived isoflavan glabridin increases the function of osteoblastic MC3T3-E1 cells. *Journal of Biochemistry*, 70:363-388.

Elnima, E.I., S, Ahmad, A., Mekkawi, A.G. and Mossa, L. 1983. The antimicrobial activity of garlic and onion extracts. *Journal of Phototherapy Research*, 20:352-358.

Esonu, B.O., Opara, M.N., Okoli, I.C., Obikaonu, H.O., Udedibie, C. and Iheshiulor, O.O.M. 2006. Physiological Response of Laying Birds to Neem (Azadirachta Indica) Leaf Meal-Based Diets: Body Weight Organ Characteristics And Haematology. *Journal of OJHAS*, 5: 972-997.

Gautam, M., Diwanay, S.S., Gairolac, S., Shinde, Y.S., Jadhav, S.S. and Patwardhan, B.K. 2004. Immune response modulation to DPT vaccine by aqueous extract of Withania somnifera in experimental system. *Journal of Ethnopharmalogy*, 4: 841-849.

Hemalatha, S., Wahi, A.K, Singh, P.N. and Chansouria, J.P. 2004. Hypoglycemic activity of Withania coagulans Dunal in streptozotocin induced diabetic rats. *Journal of Ethnopharmacology*. 93: 261-264.

Jayant, N., Dhuley, B. 1997. Effect of ashwagandha on lipid peroxidation in stress-induced animals. *Journal of Ethnopharmacology*, 60: 173-178.

Jeong, F. and Yang, D.P. 1994. The use of *Aloe vera* in the treatment of anticancer. *Phototherapy Research*, 10: 348-350.

Koo, M.W.L. 1994. *Aloe vera*: antiulcer and antidiabetic effects. *Journal of Phototherapy Research*, 8: 461-464.

Küpeli, E., Koşar, M., Yeşilada, E., Hüsnü, K. and Başer, C. 2002. A comparative study on the anti-inflammatory, antinociceptive and antipyretic effects of isoquinoline alkaloids from the roots of Turkish Berberis species. *Journal of Life Science*, 72: 645-657.

Lewis, M.R.., Rose, S.P., Mac kenzie, A.M. and Tucker, L.A. 2003. Effect of dietary inclusion of plant extract on the growth performance of male broiler chicken. *Journal of British Poultry Science*, 20: 78-82.

Mascolo, N., Jain, R., Jain, S.C. and Capasso, F. 1989. Ethnopharmacologic investigation of ginger (*Zingiber officinale*). *Journal of Ethnopharmacology*, 27: 129-140.

Mehrdad, R., Khalilia, M. and Mahdavia, F. 2006. The effect of chronic administration of Withania somnifera on learning and memory deficits of diabetic rats. *Journal of Alzheimer's and Dementia*, 2: 231.

Nishant, P., Visavadiyaa, K. and Narasimhacharya, A.V.R.L. 2006. Hypocholesteremic and antioxidant effects of Withania somnifera (Dunal) in hypercholesteremic rats. *Journal of Phytomedicine*, 2: 136-142.

Parihar, M.S., Chaudhary, M., Shetty, R. and Hemnani, T. 2003. Susceptibly of hippocampus and cerebral cortex to oxidative damage in streptozotocin treated mice: prevention by extracts of Withania somnifera and Aloe vera. *Journal of Clinical Neurological science*, 11: 397-402.

Petit, P., Sauvaire, Y., Ponsin, G., Manteghetti, M., Fave, A. and Ribes, G. 1993. Effect of a fenugreek seed extract on feeding behaviour in the ratmetabolic endocrincorrelates. *Pharmacology, Biochemistry and Behaviour*, 45: 369-374.

Saoo, K., Miki, H., Ohmori M. and Winters, W.D. 1996. Antiviral activity of aloe extracts against cytomegalo virus. *Journal of Phototherapy Research*, 10: 348-350.

Sarika, J., Pandhi, P., Singh, A.P. and Malhotra, S. 2006. Efficacy of standardised herbal extracts in type 1 diabetes - an experimental study. African Journal of Traditional *Complementary and Alternative Medicine*, 3: 23-33.

SAS Institute. 1988. SAS User's Guide: Statistics. SAS Institute, Inc., Cary, NC

Sham, D., Chitreb, D. and Patwardhan, B. 2003. Immunoprotection by botanical drugs in cancer chemotherapy. *Journal of Ethnopharmacology*, 90: 49-55.

Steel, R.G.D. and Torrie, J.H. 1981. principles and procedures of statistics: A biometrical approach. 2nd. Ed. McGraw-Hill, Singapore.

Sudhir, S., Budhiraja, R.D., Miglani, G.P., Arora, B., Gupta, L.C. and Garg, K.N. 1986. Pharmacological Studies on Leaves of *Withania somnifera. Plant Medicine*, 52: 61-63.

Thomson, M., Al-Qattan, K.K., Al-Sawan, S.S., Alnaqeeb, M.A., Khan, I. and Ali, M. 2002. The use of ginger (Zingiber officinale Rosc.) as a potential anti-inflammatory and antithrombotic agent. *Journal of Prostaglandins Leukotriens and Essential Fatty Acids*, 67: 475-478.

Thyagarajan S., Jayaram, S., Gopalakrishnan, V., Hari, R., Jeyakumar, P. and Sripathi, M. 2002. Herbal medicines for liver diseases in India. *Journal of Gastroentrology and Hepatitis,* 17: 370-376.

Udupa, S.L., Udupa, A.L. and Kulkarni, D.R. 1994. Anti-inflammatory and wound healing properties of *Aloe vera*. *Journal of Fitoterapia*, 65: 141-145.

Werner, M., Gabrielson, D.G. and Eastman, G. 1981. Ultramicrodeterminations of serum triglycerides by bioluminescent assay. *Clinical Chemistry*, 21:268-271.

Zenner, L., Callait, M.P., Granier, C. and Chauve, C. 2003. *In vitro* effect of essential oils from *Cinnamomum aromaticum*, Citrus limon and *Allium sativum* on two intestinal flagellates of poultry, *Tetratrichomonas gallinarum* and *Histomonas meleagridis*. *Journal of Parasitology*, 10:153-157.