Effect of Seabuckthorn (*Hippophae Rhamnoides*)- Leaves, Pulp and Oil on Growth Performance, Carcass Characteristics and Meat Quality of Broilers Chicken

G.P. Pathak*, Navjot Sharma, B.G. Mane, Dinesh Sharma, D. Krofa and S. K. Khurana

DGCN College of Veterinary and Animal Sciences, CSKHPKV, Palampur (HP), India-176 062.

**Abstract**

The present study was undertaken to assess the effect of feeding Seabuckthorn (SBT) leaves extract, pulp and oil in broiler chicken. The eighty (80) day old broiler chicks were randomly divided into four groups consisting of 20 chicks in each group. The control (group I) provided only basal diet, while group II diet contained 1000 ppm SBT leaf extract, group III contained 400 ppm of SBT pulp and group IV contained SBT seed oil 0.5 ml/kg in feed. The growth performance, feed intake, feed conversion ratio, carcass characteristics, organ weights and meat quality were analyzed after 42 day experiment to assess the cumulative effect of treatments. Significant (P>0.05) increase in body weight and non significant decrease in FCR were noticed. The internal organ weights differed non-significantly between groups. Carcass traits like chilled weight, breast weight, thigh weight and drum-stick weight were improved, however the differences were non-significant. Meat composition also indicated improvement in protein content and fat content of breast and thigh muscles of carcass. It is concluded that the dietary supplementation of Seabuckthorn leaves extract, pulp and oil in feed is capable of providing better growth performance, carcass and meat traits in broiler chickens.

**Keywords**: Seabuckthorn, Broiler chicken, Growth performance, Carcass traits, Meat quality.

1. **Introduction**

The impressive growth in the poultry meat industry is the result of technological breakthroughs in breeding, feeding and health, and thus one can find sizeable investments from the private sector. The expansion in supply has been spurred by rising incomes and has resulted in lower poultry prices in India, where much of the growth has occurred (USDA, 2004). Herbs have been used as food and for medicinal purposes for centuries. The World Health Organization estimated that 80% of the earth's inhabitants rely on traditional medicines for their primary health care needs, and most of this therapy involves the use of plant extracts or their active components. Those plants and their components are perceived as “natural” and “safe” by consumers. Such compounds have already been established as flavorings in human and animal feeds. Herbs or products including plant extracts, essential oils or the main components of the essential oil are among the alternative growth promoters that are already being used in practice (Ocak et al., 2008).

Seabuckthorn is an important medicinal resource and is found in abundance in Indian subcontinent especially the North Western Himalayan regions (Dhanze et al., 2013). The plant inhabits dry temperate region and high altitude regions of Himachal Pradesh, Jammu and Kashmir and Ultrakhad. In ancient Greece, the leaves of Seabuckthorn when added to horse fodder were found to result in weight gain and shiny hair, thus the Latin name ‘*Hippophae*’ meaning shining horse, was ascribed to it (Rongsen, 1991a). Seabuckthorn (*Hippophae rhamnoides*) is a small shrub comprised of fruit and leaves that are rich in nutrients and bioactive components such as vitamins (Kudritskaya et al., 1989), amino acids (Repyakh et al., 1990), lipids (Goncharova and Glushenkova, 1993), sugars and acids (Yang, 2009), and flavonoids (Häkkinen et al., 1999). Recently studies have shown that seabuckthorn has antioxidant properties (Geetha et al., 2002). Keeping the above view, the present study was undertaken to assess the effect of feeding
Seabuckthorn (SBT) leaves extract, pulp and oil in broiler chicken.

2. Materials and Methods

2.1 Collection of Plant Material

The leaves, pulp and seed of Seabuckthorn were collected from Highland Agricultural Research and Extension Centre, Farm Science Centre, CSKHPKV, Kukumseri, Lahaul and Spiti-Himachal Pradesh, India.

2.2 Preparation of Extract

The leaves of Seabuckthorn were collected, shade dried and ground to obtain the fine powder. The powder was used for preparation of extract. The 100 g fine powder was soaked in 800 ml of solvent for (methanol) 24 h with continuous stirring. The mixture was filtered through Whatman No. 1 filter paper. The filtrate was vacuum dried in rotary vacuum evaporator at 40°C. The extract was lyophilized and stored at 4°C till further use. The extract was used for the in vivo studies. Seabuckthorn pulp was lyophilized and stored at 4°C till further use, Seabuckthorn seed oil obtained from seed by manual extraction method.

2.3 Birds and Housing

The present study was carried out on eighty (80) day-old broiler chicks (Ross), procured from commercial hatchery. Birds were weighed, wing banded, and randomly distributed into 4 groups each of 20 birds each at the Poultry farm at CSKHPKV, Palampur (H.P.) University. They reared in a battery brooder with a random distribution of individuals among the dietary experimental groups. The temperature degree and humidity percentages were measured daily and recorded approximately 35±2.0 °C and 65±3.0 percentage as averages at the first week, then the temperature gradually decreased with age until the end of the experiment. Continuous lighting program (24 hr) used during the completely experimental period. The study lasted 6 weeks. Birds vaccinated against Newcastle disease and infectious bronchitis by spray method at one day of age, Newcastle disease at 8 days and infectious bursal disease at 14 days of age. Recording individual body weight was at 1, 2, 3, 4, 5, and 6 weeks of age. Feed was weighed initially when added to each feeder and at each 7-day interval. Feed added to the feeders between the weekly weights was included in the total weekly feed intake value. They were acclimatized in the new environment for two weeks. All the experiments detailed in this study were conducted according to the guidelines of Institutional Animal Ethical Committee.

2.4 Experimental Diets

The basal diet was a commercial-type corn-soybean meal diet formulated to meet nutritional requirements of growing chicks as recommended by (Leeson and Summers, 1997) and contained 24% crude protein and 3188 Kcal metabolizable energy. Offering feeds and water were ad libitum for chicks along the experimental period. The ingredients and calculated composition of the basal diet used to prepare the dietary treatments.

2.5 Experimental Design

This study carried out on eighty 1-d-old male broiler chicks (Ross) and randomly distributed into 4 groups with two replicates each of 10 birds each. The experimental treatments were consisted of four groups. Group 1 has (control), Group 2 contains 10000 ppm SBT Leaf extract; Group 3 contains 400 ppm of SBT pulp and Group 4 contains SBT seed oil (0.5 ml/kg body wt.). Cumulative feed intake and BW were measured weekly.

On day 42, birds were sacrifice and total carcass weight and weight of liver, kidney, spleen, gizzard and heart were recorded and expressed as a percentage of total carcass weight. Carcass characteristics and fat pad measurement taken from each bird. Moisture, fat and protein analyses were conducted on skinless thigh and breast meat sample in Department of Livestock Product technology, CSKHPKV, Palampur, HP India.

All data were subjected to ANOVA using the General Linear Models Procedure of SAS software (SAS, 2002). Treatment means were tested using the Duncan’s multiple range test, and statistical differences declared at P<0.05.

3. Results and Discussion

The present study was undertaken to investigate the effect of Seabuckthorn leaves extract, pulp and oil supplementation on broiler growth performance and carcass traits.

3.1 Growth Performance

The effect of Seabuckthorn leaves extracts, pulp and oil supplementation on the growth performance was studied on the basis of body weight gain (gm), feed conversion ratio (FCR) and organ body weight ratio. The effect of Seabuckthorn leaves extract, pulp and oil supplementation on body weight gain and feed conversion ratio are presented in Tables 1 and 2. The supplementation of Seabuckthorn leaves extract, pulp and oil significantly (P<0.05) increased the weight gain when compared to control birds. FCR was decrease non significantly. The findings with respect to Seabuckthorn supplementation are in accordance with...
Geetha et al. (2002), who reported that oral feeding of the ethanolic extract of Seabuckthorn leaves significantly increase the body weight gain.

Table 1: Effect of seabuckthorn (SBT) on body weight, feed intake and feed conversion ratio (FCR) of broilers (42d)

<table>
<thead>
<tr>
<th>Treatment</th>
<th>Body weight (g)</th>
<th>Feed intake (g)</th>
<th>FCR</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control</td>
<td>1550±12.4a</td>
<td>4000a</td>
<td>2.58</td>
</tr>
<tr>
<td>SBT Leaves extract</td>
<td>1780±17.2b</td>
<td>3800a</td>
<td>2.13</td>
</tr>
<tr>
<td>SBT pulp</td>
<td>1750±12.9b</td>
<td>3850a</td>
<td>2.20</td>
</tr>
<tr>
<td>SBT Oil</td>
<td>1850±13.1b</td>
<td>3760b</td>
<td>2.03*</td>
</tr>
</tbody>
</table>

*Mean ± SE for 10 birds; **Means with same superscripts within a column do not differ from each other (P>0.05)

Effect of Seabuckthorn leaves and oil on the relative organs weight (g/100g body weight) of broilers through 42 days of rearing period were non-significant, however in SBT pulp group an insignificant decrease in spleen weight. There were no significant (P>0.05) changes in relative weight of liver, kidney, gizzard, heart and spleen.

Seabuckthorn is a rich source of carbohydrates, vitamins (A and B), proteins, steroids, and flavonoids (Ambaye and Indap, 1970; Bernath and Foldesi, 1992). The young leaves of Seabuckthorn posses high content of carotene and flavonoids (Chen, 1988). Rongsen (1991b) reported that H. rhamnoides sp. gyantsensis contained the highest concentration of crude protein (22.9%) and fat (6.1%) whereas; H. neurocarpa had the lowest amount of CP (11.5%) and fat (3.7%). Similar result reported from Xucham (1989) reported that Seabuckthorn leaves and fruit cakes increase body weight in pigs and broilers from 9 to 13% and 25 to 29% respectively.

3.2 Carcass Characteristics of Broiler

The effect of Seabuckthorn leaves extract pulp and oil supplementation on the carcass yield of broiler recorded at the end of the experiment and the results are presented in Table 3. Processing live weight and chilled weight (gm) increases (P>0.05) significantly in SBT leaves, pulp and oil treated groups compared to control group. Other carcass traits like fat pad weight, breast weight, thigh weight, drum stick and wing weight (% of chilled weight) were increase non significantly. Singh and Sharma (2008) reported that the supplementation of diet with SBT leaves resulted in increase in weight by 9.4 to 21.3% in pigs. This increase in carcass quality may be due to improvement in body weight as the Seabuckthorn is a rich source of carbohydrates, vitamins (A and B), proteins, steroids, and flavonoids.

Table 2: Effect of seabuckthorn on the relative organs weight (g/100g) body weight of broilers through 42 days of rearing period

<table>
<thead>
<tr>
<th>Groups</th>
<th>Liver</th>
<th>Kidney</th>
<th>Heart</th>
<th>Gizzard</th>
<th>Spleen</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control</td>
<td>2.76±0.08a</td>
<td>0.65±0.03b</td>
<td>0.53±0.02a</td>
<td>1.65±0.03a</td>
<td>0.20±0.007a</td>
</tr>
<tr>
<td>SBT Leaves</td>
<td>2.51±0.07a</td>
<td>0.73±0.02a</td>
<td>0.50±0.01a</td>
<td>1.97±0.15a</td>
<td>0.22±0.01a</td>
</tr>
<tr>
<td>extract</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SBT pulp</td>
<td>2.87±0.17b</td>
<td>0.60±0.02b</td>
<td>0.53±0.02a</td>
<td>1.84±0.07b</td>
<td>0.140±0.007b</td>
</tr>
<tr>
<td>SBT Oil</td>
<td>2.65±0.12a</td>
<td>0.64±0.02b</td>
<td>0.42±0.01b</td>
<td>1.74±0.07b</td>
<td>0.25±0.16b</td>
</tr>
</tbody>
</table>

*Mean ±SE for 10 birds; **Means with same superscripts within a column do not differ from each other (P>0.05)

Table 3: Effect of seabuckthorn (SBT) on carcass characteristics of broiler chicken

<table>
<thead>
<tr>
<th>Group/ Carcass Yield</th>
<th>Carcass Yield</th>
<th>Control</th>
<th>SBT Leaves extract</th>
<th>SBT pulp</th>
<th>SBT Oil</th>
<th>SEM</th>
</tr>
</thead>
<tbody>
<tr>
<td>Processing live wt.</td>
<td>1550±12.4a</td>
<td>1780±17.2b</td>
<td>1750±12.9b</td>
<td>1850±13.1b</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Chilled wt.</td>
<td>1038.5a</td>
<td>1235b</td>
<td>1186.5b</td>
<td>1300b</td>
<td></td>
<td>18.3</td>
</tr>
<tr>
<td>Chilled wt. (%) of live wt</td>
<td>67.00</td>
<td>69.38</td>
<td>67.8</td>
<td>70.34</td>
<td>0.095</td>
<td></td>
</tr>
<tr>
<td>Fat pad wt. (g/bird)</td>
<td>27.00</td>
<td>30.00</td>
<td>28.00</td>
<td>32.00</td>
<td>0.45</td>
<td></td>
</tr>
<tr>
<td>Fat pad wt. (%) of live wt</td>
<td>1.55</td>
<td>1.68</td>
<td>1.60</td>
<td>1.72</td>
<td>0.16</td>
<td></td>
</tr>
<tr>
<td>Breast wt (%) of chilled wt</td>
<td>18.95</td>
<td>21.24</td>
<td>22.22</td>
<td>21.60</td>
<td>0.08</td>
<td></td>
</tr>
<tr>
<td>Thigh wt. (%) of chilled wt</td>
<td>18.42</td>
<td>19.22</td>
<td>19.01</td>
<td>20.12</td>
<td>0.55</td>
<td></td>
</tr>
<tr>
<td>Drum wt. (%) of chilled wt</td>
<td>16.0</td>
<td>16.2</td>
<td>16.45</td>
<td>17.01</td>
<td>0.04</td>
<td></td>
</tr>
<tr>
<td>Wing wt. (%) of chilled wt</td>
<td>10.45</td>
<td>11.6</td>
<td>12.02</td>
<td>12.22</td>
<td>0.052</td>
<td></td>
</tr>
</tbody>
</table>

*Mean ±SE for 10 birds
of breast and thigh of the carcass. It was observed that non-significant improvement in protein and fat content in SBT leaves, pulp and oil in feed of broilers, however comparatively. Meat composition not much affected by SBT leaves, pulp and oil in feed of broilers, however non-significant improvement in protein and fat content was observed in this study.

### 3.3 Meat Composition

The effect of Seabuckthorn leaves extract, pulp and oil supplementation on the meat composition of broiler recorded at the end of the experiment and the results are presented in Table 4. Meat composition studied on the basis of moisture, protein and fat content of breast and thigh of the carcass. It was observed that protein content of breast and thigh improved comparatively. Meat composition not much affected by SBT leaves, pulp and oil in feed of broilers, however non-significant improvement in protein and fat content was observed in this study.

### 4. Conclusion

After utilization of various products for poultry consumption, many byproducts remain unutilized though they contain immense nutraceutical values. The Seabuckthorn leaves, pulp and oil can be used as feed ingredients in broiler chicken diets for feeding better production and carcass traits. However, some more studies are needed to analyse the effect of Seabuckthorn leaves, pulp and oil on quality attributes such as fatty profile, cholesterol content, antioxidative and storage quality of broiler chicken meat.

### References


