Biological Forum – An International Journal **14(4): 232-236(2022)**

ISSN No. (Print): 0975-1130
ISSN No. (Online): 2249-3239

Biochemical and Sensory Characterization of Chicken Eggs from different Farm Production System

Deepak Singh[1*], Nazim Ali[2], Dev Saran Sahu[2], Mahesh Kumar Bharti[3], Ahmad Fahim[4] and Pramod Kumar Maddheshiya[2]

[1]Department of Agriculture, Meerut Institute of Technology Meerut (Uttar Pradesh), India.
[2]Department of Animal Husbandry and dairying
Sardar Vallabhbhai Patel University of agriculture and technology Meerut (Uttar Pradesh), India.
[3]Department of Veterinary Physiology and Biochemistry
Sardar Vallabhbhai Patel University of agriculture and technology Meerut (Uttar Pradesh), India.
[4]Department of Livestock and Production Management
Sardar Vallabhbhai Patel University of agriculture and technology Meerut (Uttar Pradesh), India.

(Corresponding author: Deepak Singh)*
(Received 15 August 2022, Accepted 27 September, 2022)
(Published by Research Trend, Website: www.researchtrend.net)

ABSTRACT: The objective of this study was to evaluate the biochemical and sensory evaluation of chicken eggs from different farm system. Biochemical parameters such as total protein and glucose in egg white was analyzed 4.49±0.13, 3.85±0.13 and 2.27±0.13, (mg/ml) and 0.72±0.03, 0.78±0.03, and 0.84±0.03 (mg/ml), total cholesterol in egg yolk was 10.11±0.09, 9.01±0.09, and 7.56±0.09 (mg/ml). But the total cholesterol in whole egg was analyzed 5.51±0.05, 6.44±0.05, and 4.42±0.05 (mg/ml) for mechanized, semi-mechanized, and non-mechanized farms respectively. The biochemical parameter of egg from different farm indicated that protein and cholesterol content was significantly higher (P<0.01) in the eggs from mechanized farm, but lower in carbohydrate content. During sensory evaluation of egg the overall acceptability in terms of taste and flavor of eggs collected from mechanized poultry farms at day 1, day 7, day 14, and day 28 was significantly higher (P<0.01). The sensory attributes in term of taste, flavor, and over all acceptability was superior in eggs collected from mechanized farm. The results revealed that the external and internal egg traits differ with the level of mechanization. The eggs from mechanized farm were found to be superior in overall quality, taste and had greater shelf life.

Keywords: Chicken eggs, total protein, total cholesterol, glucose and sensory evaluation.

INTRODUCTION

The contribution of poultry products to the provision of numerous key components for adequate and balanced human nutrition is significant. Eggs are a great meal option for many people with unique dietary needs because of their high nutritional density in relation to their calorie level. Despite recent scientific and technological advancements in the poultry business making it feasible to produce eggs in plenty and at a low cost, egg consumption has not significantly increased in the majority of countries (Kumar *et al*., 2021). The main causes of this are eating patterns, the high cholesterol content of eggs, and the notion that foods high in cholesterol have a significant role in the development of atherosclerosis and heart disease. A daily consumption of fewer than 300 mg of dietary cholesterol is advised. A single egg has a 220 mg of cholesterol (Aziz *et al.*, 2012). The cholesterol content of the egg yolk may be affected by a number of factors such as the age of the hen, genotype, rearing system and diet, and can be lowered by environmental and nutritional manipulations (Aygun and Olgun 2019).

Due to the high quality proteins and wide range of vitamins and minerals it contains, eggs are a very nutrient-dense food. The albumen, sometimes referred to as the egg white, makes up about 58% of an egg's weight. The egg white is made up of two thick layers in concentric layers, divided by inner and outer thin layers. The vitelline membrane that encircles the yolk is continuous with the chalazae, which are found inside these layers of the albumen. Ovalbumin makes up more than half of the protein in egg whites, with smaller contributions from conalbumin, ovomucid, and globulins (including lysozyme, which can lyse some germs), (Solis *et al*., 2017). Whites are frequently cooked and consumed on their own or added to recipes since they contain more protein than the yolk. When used in place of a complete egg, egg whites increase protein while decreasing fat and cholesterol (Shinn *et al.*, 2016).

About 50% of an egg yolk's weight is made up of solids. Lipoprotein particles such as high-density lipoprotein (HDLs), low-density lipoprotein (LDLs), and phosvitin are among the principal components of the solid matter in egg yolk, which is mostly composed of lipids (65-70% on a dry basis) and proteins (30% on a dry basis) (Sheoran *et al.,* 2017; Ukachukwu *et al.,* 2017). Approximately 0.6% of the 1.0% of total carbohydrates in eggs is found in free form. The primary carbohydrate found in eggs is glucose, which has been demonstrated to interact quickly with egg proteins. In the present study egg produced under different farm conditions were analysed for better nutritional quality.

MATERIAL AND METHODS

Collection of egg: Eggs were collected from different farms under different production system. These farms were classified based on the levels of mechanization, i.e. mechanized, semi-mechanized and non-mechanized. These eggs were compared based on external and internal traits to assess the quality of eggs.

Sample preparation: Collected chicken eggs from all the three types of farms were 1 day old. Eggs were washed by tap water, left to dry, and then stored at 4°C within 5 day of purchase before experiments.

Analysis of biochemical parameters: The egg white and yolk were separated, and the chalazae were taken out, in order to determine the proximate components of eggs. To get rid of chalazae and any albumen residue stuck to the vitelline membrane, the yolk was carefully rolled on filter paper (Whatman No. 4). Using a scalpel blade, the vitelline membrane was then split, and the yolk was collected in a beaker. Manual egg breaking was used to obtain the entire egg. Next, a gentle whisk was used to combine the egg white, yolk, and entire egg. The protein, cholesterol, and glucose content of whole eggs, egg whites, and yolks were examined to determine their proximate composition.

Estimation of total protein from egg white: Using the biuret method, the total protein in the egg white samples was calculated. One medium-sized chicken egg was carefully divided into its white and yolk. The egg white's volumes were measured in a graduated cylinder that had already been pre-weighed before being weighed on an analytical balance. Protein characterisation was done using the extracted egg white. After that, distilled water 10 times its volume was carefully incorporated into the egg white before being diluted. The egg white solution was then centrifuged for 15 minutes at 18,000 g and 4°C. The supernatant's protein content was calculated using the Biuret method. The reduction of Cu^{++} by protein in an alkaline environment is the foundation of this protein quantification technique. With the resultant Cu^{+}, biuret reagent acid forms a blue-colored combination. At 546 nm, the complex's absorbance was gauged. The content was ascertained after 5 minutes of incubation at 37°C. Samples with the same amount of protein as the control sample were given the solubility of 100%.

Estimation of glucose by glucose oxidase method: The sample glucose is transformed into gluconate and hydrogen peroxide by the enzyme glucose oxidase (GOD). The chromogen-4-amino antipyrine/phenolic molecule is oxidised (POD) by hydrogen peroxide in the presence of peroxidase to a red-colored product. According to Trinder's 1969 research, the intensity of the red-colored substance, which is detected at 505 nm, is proportionate to the glucose concentration.

Estimation of cholesterol in egg yolk and whole egg: The CHOD/POD technique was used to estimate cholesterol (Jonas *et al.* 1984). By using cholesterol ester hydrolase (ChEH), the sample's cholesterol esters are hydrolyzed in this procedure. Cholesterol oxidase then produces 4-cholesten-3-one and H_2O_2 from the free cholesterol that has been liberated (CHOD). Hydrogen peroxide (H_2O_2) and 4-Aminoantipyrine are converted into a detectable red quinonimine derivative that absorbs light at 505 nm in the presence of phenol and peroxidase (POD).

Sensory evaluation of eggs: The eggs from different breeds/varieties of chicken was collected and stored at 4ºC till their sensory evaluation. A panel of 10 semi-trained members was selected and then carried out the overall acceptance test based on taste, aroma, appearance and flavour by using 9-point Hedonic scale, where 9 is “like extremely” and 1 is “dislike extremely” as described by (Amerine *et al.*,1965). A panellist from students and staff of the University who was willing to consume eggs and having no allergies to eggs was selected for the experiment. The panellists were introduced to different evaluation techniques (e.g., smelling and tasting eggs) and evaluation of the different testing procedures was discussed. The test was carried out between the hours of 09:30 to 11:30 am, with the consideration within that time the panellists are not too hungry nor too full. The eggs were-

— Hard-boiled eggs: The eggs were cooked in boiling water for 8 min, cooled slowly to room temperature, shelled and the yolks separated.

— Semi-boiled eggs: The eggs were cooked in boiling water for 4 min, cooled slowly to room temperature, shelled and the yolks separated.

Each egg was divided into 4 portions. A plate containing each portion of egg from different breeds was presented to the panellist. The portions for odours evaluation were stored in sealed containers to preserve odours compounds. The samples were prepared without salt addition. The panellists were instructed to cleanse their palate (mouth) between each sample with normal saline water. The sensory evaluation was based on following attributes of egg:

(a) Aroma: Odour of the whole egg coming from the reared container in which the portion of eggs were kept.

(b) Flavour: The distinctive aroma of the yolk, bringing it close to the nostrils.

(c) Taste: The presence of something agreeable or disagreeable differing from the typical egg taste.

(d) Overall acceptability: An integrated sensation based on aroma, flavour, after taste, and presence of off-flavour (if any).

Statistical analysis: The data of different variables were analysed by MIXED Model of SPSS software

(SPSS for Windows, V 19.0; SPSS, Inc., Chicago, IL, USA)

RESULTS AND DISCUSSION

Biochemical Parameters: The average total protein in egg white of eggs in collected in different farm categories in mg per ml was analysed 4.49±0.13, 3.85±0.13 and 2.27±0.13,(mg/ml) for mechanized, semi-mechanized and non-mechanized farms respectively. The total protein content in mg per ml recorded on the treatment groups differed significantly (P<0.01). The egg as a whole is considered as a good source of protein and lipids, but egg white mainly consists of water (88%) and protein (11%) and it is lacking in lipids. Total protein contents in the eggs of mechanized farm condition was maximum than semi-mechanized and non-mechanized farm condition. Nutritional factors can also affect egg white quality. The diets adopted have a high correlation with egg white composition. It has been demonstrated that egg white content is influenced by feed vitamin concentration, particularly water soluble vitamins. The egg white is a good source of riboflavin, folic acid, niacin, thiamine, pyridoxine, pantothenic acid, biotin, and vitamin B_{12}, and the concentrations of these nutrients depend on the content of the diet (Leeson and Caston 2003). The egg white also does a good job of transferring trace elements. Iodine (Yalcin, 2001), selenium (Surai and Dvorska 2001), and copper (Idowu, 2006) concentrations in egg whites are related to diet levels.The average glucose content in egg white of eggs, collected in different farm categories in mg per ml was analysed 0.72±0.03,0.78±0.03, and 0.84±0.03(mg/ml)for mechanized, semi-mechanized, and non-mechanized farms respectively. Total glucose contents in the eggs of mechanized farm condition was minimum than semi-mechanized and non-mechanized farm condition.

The average total cholesterol in egg yolk of eggs in collected in different farm categories in mg per ml was analysed 10.11±0.09, 9.01±0.09, and 7.56±0.09 (mg/ml)for mechanized, semi-mechanized, and non-mechanized farms respectively. But the average total cholesterol in whole egg of eggs in collected in different farm categories in mg per ml was analysed 5.51±0.05, 6.44±0.05, and 4.42±0.05 (mg/ml)for mechanized, semi-mechanized, and non-mechanized farms respectively. The total cholesterol content in both yolk and whole egg in mg per ml recorded on the treatment groups differed significantly (P<0.01). Sheoran *et al.* (2017) reported higher mean values of egg yolk cholesterol (13.55 mg/g) in white leghorn chickens compared to the current investigation. According to Ukachukwu *et al.* (2017), the average amount of cholesterol in egg yolks was 4.03 mg/g in chicken eggs and 6.79 mg/g in quail eggs. According to Aziz *et al.* (2012), chicken, duck, and quail eggs had mean cholesterol levels of 7.65 0.28, 10.36 0.94, and 16.05 0.63 mg/g, respectively. Quail eggs had a considerably greater cholesterol level (P<0.05) compared to chicken and duck eggs, while chicken eggs had a much lower cholesterol content. In addition, duck eggs' cholesterol content differed significantly (P <0.05) from that of chicken and quail eggs. The findings of the present investigation were numerically different from those published by Jalaludeen *et al.* (2004), who found that duck eggs had greater cholesterol levels than chicken eggs (884 and 548 mg per 100 g, respectively, for duck and chicken eggs). In accordance with the current findings, Jalaludeen *et al.* (2006) also stated that the eggs of chicken, duck, and quail contain 423, 884, and 844 mg of cholesterol per 100 g, respectively. The cholesterol level in duck and quail eggs was on the greater side, while that in chicken eggs was on the lower side, despite the fact that the numbers in the previous studies on cholesterol content were numerically different from the current findings.

Many factors affect the cholesterol content of egg and serum. In this experiment, total cholesterol contents egg yolk in mechanized farm condition was maximum than semi mechanized and non-mechanized farm condition. But total cholesterol contents in whole egg in semi-mechanized farm condition was maximum than mechanized and non-mechanized farm condition. Eggs from laying hens raised in floor pens had lower cholesterol levels than eggs from chickens raised in cages. This result, however, was different from Scholtyssek, (1982) in terms of egg cholesterol content, he came to the conclusion that cage raising performed better than the alternative rearing strategy. According to Turk and Barnett (1971), these differences between cage and floor pen rearing were not substantial and called for additional research. Cage upbringing was cited by some researchers as a stressor that significantly increased serum cholesterol.

Sensory evaluation of eggs: The results of sensory evaluation of egg are present in Table 1. The overall acceptability in terms of taste and flavour of eggs collected from mechanized poultry farms at day 1, day 7, day 14, and day 28 was 7.07±0.03, 6.98±0.02, 6.87±0.02, and 6.79±0.02, respectively. The taste of eggs at mechanized farms at day 1 day 7, day 14, and day 28 was 7.53±0.20, 7.31±0.21, 6.93±0.03, and 6.75±0.06, respectively. . The flavour of eggs at mechanized farms at day 1 day 7, day 14, and day 28 was 6.54±0.02, 6.50±0.02, 6.47±0.03 and 6.45±0.02, respectively.

The overall acceptability in terms of taste and flavour of eggs collected from semi-mechanized poultry farms at day 1, day 7, day 14, and day 28 was 6.72±0.02, 6.72±0.02, 6.35±0.08, and 6.23±0.07, respectively. The taste of eggs at semi-mechanized farms at day 1 day 7, day 14, and day 28 was 6.93±0.07, 6.75±0.05, 6.54±0.07 and 6.33±0.03, respectively. . The flavour of eggs at semi-mechanized farms at day 1 day 7, day 14, and day 28 was 6.40±0.02, 6.38±0.02, 5.53±0.06, and 5.40±0.04, respectively.

The overall acceptability in terms of taste and flavour of eggs collected from non-mechanized poultry farms at day 1, day 7, day 14, and day 28 was 6.13±0.06, 6.03±0.05, 5.95±0.07 and 5.83a±0.06 respectively. The taste of eggs at non mechanized farms at day 1 day 7, day 14, and day 28 was 6.62±0.06, 6.51±0.08, 6.28±0.07, and 6.16±0.04, respectively. The flavour of

eggs at non mechanized farms at day 1 day 7, day 14, and day 28 was 5.26±0.03, 5.14±0.02 5.95±0.07 and 5.83±0.06 respectively. In a related study, the panellists had a tendency to rate the look of farm eggs higher than the eggs produced using industrial production processes. Contrary to what Hayat *et al.* (2010); Schneider *et al.* (2013) stated, they discovered no appreciable variations in the appearance and texture of eggs produced using conventional and organic methods. The interior quality of the egg may have decreased during the storage period, which could account for the variations in appearance. Another factor to take into account was the diverse bird genetics used in egg production systems (Wan *et al.* 2019) and the various food supplements used (Janist *et al.* 2019), both of which affected the egg's appearance.

Table 1: Total content of Protein, Glucose and total cholesterol in chicken eggs produced from different farm categories.

Farms	Parameters (mg/ml)			
	Protein (Egg white)	Glucose (Egg white)	Cholesterol (egg yolk)	Cholesterol (whole egg)
Mechanized (S_1)	4.49±0.13^{c}	0.72±0.03^{a}	10.11±0.09^{c}	5.51±0.05^{b}
Semi- mechanized (S_2)	3.85±0.13^{b}	0.78±0.03^{a}	9.01±0.09^{b}	6.44±0.05^{c}
Non mechanized (S_3)	2.27±0.13^{a}	6.84±0.03^{a}	7.56±0.09^{a}	4.42±0.05^{a}

Least square means being different superscript in row differ significantly (P<0.01)

Table 2: Sensory evaluation of eggs.

Farms	Parameters	1 day	7 day	14 day	28 day	Overall mean
Mechanized	Taste	7.53±0.20^{d}	7.31±0.21^{d}	6.93±0.03^{c}	6.75±0.06^{bc}	7.13±0.13
	Flavor	6.54±0.02^{e}	6.50±0.02^{d}	6.47±0.03^{cd}	6.45±0.02^{bc}	6.56±0.06
	Overall acceptability	7.07±0.03^{e}	6.98±0.02^{de}	6.87±0.02^{cd}	6.79±0.02^{bc}	6.93±0.03
Semi-mechanized	Taste	6.93±0.07^{d}	6.75±0.05^{cd}	6.54±0.07^{ab}	6.33±0.03^{a}	6.63±0.04
	Flavor	6.40±0.02^{ab}	6.38±0.02^{a}	5.53±0.06^{e}	5.40±0.04^{de}	5.93±0.03
	Overall acceptability	6.72±0.02^{ab}	6.61±0.02^{ab}	6.35±0.08^{e}	6.23±0.07^{de}	6.48±0.02
Non mechanized	Taste	6.62±0.06^{bc}	6.51±0.08^{b}	6.28±0.07^{a}	6.16±0.04^{a}	6.39±0.05
	Flavor	5.26±0.03^{cd}	5.14±0.02^{bc}	5.00±0.04^{ab}	4.91±0.04^{a}	5.08±0.04
	Overall acceptability	6.13±0.06^{cd}	6.03±0.05^{bc}	5.95±0.07^{ab}	5.83±0.06^{a}	5.99±0.07

Least square means being different superscript in row differ significantly (P<0.01)

CONCLUSION

Undoubtedly one of the most adaptable food is chicken eggs. They include vital vitamins, minerals, and high-quality proteins, carbs, and fats that are simple to digest. Our study showed a significance difference in the biochemical composition of eggs produced under different farm conditions. Biochemical analysis revealed a significance difference in total protein, total cholesterol and glucose. Protein content of egg under different farm system was higher in the eggs of mechanized farm system and the carbohydrate content was lower in the mechanized system but cholesterol content was lower in non-mechanized farm. In case of sensory evaluation of eggs, the trained panelists showed that the eggs from mechanized farm system were preferable in terms of flavor, aroma, and overall acceptability. So the sensory attributes in term of taste, flavor, and over all acceptability was superior in eggs collected from mechanized farm.

FUTURE SCOPE

The findings of this study will be useful for the poultry forming in production of high-quality eggs for breeding of next generation as well as for egg consumers in selecting high-quality eggs for consumption.

Conflict of Interest. None.

REFERENCES

Amerine, M. A., Roessler, E. B. and Ough, C. S. (1965). Acids and the acid taste. I. The effect of pH and titratable acidity. *American Journal of Enology and viticulture, 16*(1): 29-37.

Aygun, A. And Olgun, O. (2019). Comparison of egg quality, yolk cholesterol and fatty acid contents of chicken, quail, partridge and pheasant eggs. *Akad. Ziraat Dergisi., 8:* 323–328.

Aziz, Z., Cyriac, S., Beena, V. and Philomina, P. T. (2012). Comparison of cholesterol content in chicken, duck and quail eggs. *Journal of Veterinary and Animal sci*ence, *43*: 64-66.

Hayat, Z., Cherian, G., Pasha T. N. and Jabbar, M. (2010). Sensory evaluation and consumer acceptance of eggs from hens fed flax seed and 2 different antioxidants *Poultry Science, 89*: 2293-2298.

Idowu, O. M. O., Laniyan, T. F., Kuye, O. A., Oladele-Ojo, V. O. and Eruvbetine, D. (2006). Effect of copper salts on performance, cholesterol, residues in liver, eggs and excreta of laying hens. *Archivos de zootecnia, 55*(212): 327-338.

Jalaludeen, A., Peethambaran, P. A., Joseph. L. and Manomohan, C. B. (2004). Duck Production in Kerala. NATP on Ducks, Centre for Advanced Studies in Poultry Science, Kerala Agricultural University, Mannuthy, Thrissur, Kerala. 44.

Jalaludeen, A. and Churchil, R. R. (2006). Duck eggs and their nutritive value. *Poultryline, 10*: 35-39.

Janist, N., Srichana, P., Asawakarn, T. and Kijparkorn, S. (2019). Effect of supplementing the laying hen diets with choline, folic acid, and vitamin B12 on production performance, egg quality, and yolk phospholipid. *Livestock Science, 223*: 24–31.

Jonas, A., Sweeny, S. A. and Herbert, P. N. (1984). Discoidal complexes of A and C apolipoproteins with lipids and their reactions with lecithin: cholesterol

acyltransferase. *Journal of Biological Chemistry*, *259*(10): 6369-6375.

Kumar, M. Dahiya, S. P. and Ratwan, P. (2021). Backyard poultry farming in India: a tool for nutritional security and women empowerment. *Biological Rhythm*, *52*: 1476–1491.

Leeson, S. and Caston, L. J. (2003). Vitamin enrichment of eggs. *Journal of Applied Poultry Science Research*, *12*: 24–26.

Schneider, B., Schwartz, F. F., Brugnaro, C., Marjotta-Maistro, C. and Verruma-Bernardi, R. M. (2013). Sensorial analysis of organic and conventional chicken eggs (*Gallus gallusdomesticus*) *Revista Colombiana de Ciencia Animal 5*: 48–57.

Scholtyssek, S. (1982). Beitragzur Wahlfutterung von Broilern.Archiv fur Geflugelkunde *European Poultry Science*, Revue de science avicoleeuropeenne.

Sheoran, N., Shunthwal, J., Bishnoi S. V. and Maan, N. S. (2017). Reducing egg and serum cholesterol by dietary inclusion of probiotics in white leghorn layers. *Indian Journal of Pure Applied Bioscience*, *5:*1229–1236.

Shinn, S. E., Liyanage, R., Lay J. O. and Proctor, A. (2016). Isolation and Characterization of Chicken Yolk Vitelline Membrane Lipids using Eggs Enriched with Conjugated Linoleic Acid. *Lipids*, *51*: 769–779.

Solís-Cruz, B., Hernández-Patlán, D., Beyssac, E., Latorre, J. D., Hernandez-Velasco, X., Merino-Guzman, R. and López-Arellano, R. (2017). Evaluation of chitosan and cellulosic polymers as binding adsorbent materials to prevent aflatoxin B1, fumonisin B1, ochratoxin, trichothecene, deoxynivalenol, and zearalenonemycotoxicoses through an in vitro gastrointestinal model for poultry. *Polymers*, *9*(10): 529.

Surai, P. and Dvorska, J. (2001). Is organic selenium better for animals than inorganic sources? *Feed Mix*, *9*(4/5): 8-10.

Trinder, P. (1969). Determination of blood glucose using an oxidase-peroxidase system with a non-carcinogenic chromogen. *Journal of clinical pathology 22*: 158-161.

Turk, D. E. and Barnett, B. D. (1971). Cholesterol content of market eggs. *Poultry science*, *50*(5): 1303-1306.

Ukachukwu, U., Ozougwu, V. and Nwankwo, N. A. (2017). Comparative study on the total cholesterol, triacylglycerides and lipid concentrations of quail and chicken eggs. International. *Journal of. Research and Pharma Bioscience, 4:* 11–16.

Yalcin, S. Z., Kahraman, S., Yalcin, S. S., Yalcin, E. H.and Deleoglu, E. H. (2001). The effects of iodine supplementation on the egg quality and egg iodine content. In *Proceedings of European Poultry Conference, Kusadasi, Turkey*, 185-190.

Wan, Y., Wang, Z., Wang, J., Su, H., Guo, X., Wu, J., Li, Q., Ni, G. and Jiang, R. (2019). Genetic parameters of the thick-to-thin albumen ratio and egg compositional traits in layer-type chickens. *British Poultry Science*, *60:* 517–521.

How to cite this article: Deepak Singh, Nazim Ali, Dev Saran Sahu, Mahesh Kumar Bharti, Ahmad Fahim and Pramod Kumar Maddheshiya (2022). Biochemical and Sensory Characterization of Chicken Eggs from different Farm Production System. *Biological Forum – An International Journal*, *14*(4): 232-236.