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The Impact of Samh Seeds on Blood Parameters of Experimental Animals

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Abstract: Samh seeds are cultivated in some regions of KSA and some people think that it can improve health. We aimed to find out the health benefits of Samh seeds. The seeds were obtained from Al Jouf, KSA and roasted for 5 min and grounded into flour. Its content from protein, fat and carbohydrate were determined. Thirty six normal male albino rats (100±5.0 g) were classified into 6 groups; control group that fed standard diet only, 5% Samh group received 5% of the seeds; 15% Samh group fed 15% of the seeds; high lipid diet group received high lipid diet (15% fat and 1% cholesterol); 5% Samh and high lipid group received high lipid diet plus 5% of the seeds and 15% Samh and high lipid diet group received high lipid diet plus 15% of the seeds. After 60 days, rats were fasted then anesthetized and blood samples were collected for determination of glucose, blood lipids, urea, creatinine, albumin, total protein, billirubin, calcium and iron. The results showed that the seeds are rich in protein (22.3±2.1%) and the administration of 5% of the seeds decreased glucose and BUN, while it elevated creatinine, albumin, total protein, cholesterol, triglycerides, HDL, calcium and iron. On the other hand the administration of 15% of the seeds decreased creatinine, albumin, cholesterol, triglycerides and LDL, while increased glucose, BUN, total bilirubin, HDL and iron. In conclusion the administration of 15% of Samh seeds flour reduce creatinine concentration and improve blood lipids especially cholesterol, HDL and LDL.

Key words: Samh, cholesterol, triglycerides, LDLc, KSA, protein

INTRODUCTION

Traditional foods play an important role in prevention and treatment of specific diseases and every country has its own foods that are a part of its culture. One of the traditional foods in Kingdom of Saudi Arabia is Al-Samh seeds (*Mesembryanthemum Forsskalei Hochst*). Seeds of Al-Samh are cultivated in several Arabian countries like Egypt, Palestine, Bahrain and Qatar, but it is more common in Saudi Arabia and cultivated in the northern providence (Showdrei, 1999). The population of northern area of KSA used Al-Samh seeds (Mesembryanthemum Forsskalei Hochst) as an important food, where they mix it with butter and date for preparing traditional recipe called Pakilla (Al-Sharari, 1988). Also, they use it in preparing breads, biscuits, Aseeda and other recipes.

A study carried out by Al-Drewish (2005) and found that the seeds of Al-Samh are rich in protein (20.5%), carbohydrate (63.05) and fats (4.8%).

Several studies showed that chronic diseases prevalence increased in KSA in recent years, where Al-Nozaha (2002) showed that 24% of Saudi population has hyperlipidemia; 24% diabetes mellitus; 26% hypertension and 36% obesity. And the prevalent were higher among males and increased in urban areas.

The folk medicine showed that there are some foods has favorable effect on human health and some foods can treat specific diseases. However, the folk medicine in Saudi Arabia Kingdom claims that Al-Samh seeds (*Mesembryanthemum Forsskalei Hochst*) can improve the health of diabetes patients. Therefore, the aim of this study was to find out the effect of Al-Samh seeds on blood glucose, lipids and other blood parameters of experimental animals.

MATERIALS AND METHODS

Samh seeds: Samh seeds (*Mesembryanthemum Forsskalei Hochst*) were obtained from Center Research and Development of Grazing Livestock in Al Jouf, Saudi Arabia. The seeds were cleaned thoroughly and washed, then roasted for 5 min and grounded into flour.

Chemical composition: The proximate chemical composition (moisture, ash, protein and fat) of Samh seed flour were carried out according to AOAC (1995).

Animals: Male albino Wister rats weighing 100±5.0 g were housed in clean cages at 20-24°C temperature, 12-h light/12-h dark cycle and relative humidity (52% in the animal house at College of Medicine, King Saud University, Riyadh-Saudi Arabia). Rats were given free access to water and diets that were prepared according to the American Institute of Nutrition (Reeves *et al*., 1993). Rats were allowed to acclimatize to the new environmental condition and received a standard diet for five days before the sixty-day experiment period.

Experimental design: Thirty six male albino Wister rats were fed suggested diets given in Table 1 and divided into six group (6 rats for each) as follow:

- Control group: this group fed standard diet (20% protein) only

Table 1: Diet composition (g/100g)

	Control	5% Samh	15% Samh	HL Diet	5% Samh and HL Diet	15% Samh and HL Diet
Casein*	23.2	21.9	19.4	23.2	21.9	19.4
Samh seeds flour	0.0	5.0	15.0	0.0	5.0	15.0
Methionine	0.4	0.4	0.4	0.4	0.4	0.4
Vitamin mixture	1.0	1.0	1.0	1.0	1.0	1.0
Mineral mixture	3.0	3.0	3.0	3.0	3.0	3.0
Corn oil	5.0	4.75	4.25	5.0	4.75	4.25
Animal Fat	0.0	0.0	0.0	10.0	10.0	10.0
Cholesterol	0.0	0.0	0.0	1.0	1.0	1.0
Sucrose	10.0	10.0	10.0	10.0	10.0	10.0
Corn Starch	57.44	53.95	46.95	46.4	42.95	35.95
Total	100.0	100.0	100.0	100.0	100.0	100.0

*Casein contain 86% protein

- 5% Samh Group: this group fed standard diet plus 5% of flour of Samh seeds
- 15% Samh Group: this group fed standard diet plus 15% of flour of Samh seeds
- High lipid diet (HL diet); this group fed diet that contain 15% fat and 1% cholesterol
- 5% Samh and HL Diet: this group fed high lipid diet plus 5% of flour of Samh seeds
- 15% Samh and HL Diet: this group fed high lipid diet plus 15% of flour of Samh seeds

Diets (Table 1): The diets used in this study were based on casein as a source of protein and each diet were designed to provide 20% protein, 5% fat, 1% vitamins, 3% minerals and carbohydrate up to 100%. While, the amount of protein, fats and carbohydrate were determined in Samh seeds flour and diets contained it were completed by casein to yield 20% protein. Finally the composition of High Lipid Diets (HL Diet) were the same of standard diet, but it contains higher amounts of fats (15%).

Biochemical analysis: On the 60th day, rats were fasted overnight and were anesthetized with light ether. A blood samples were collected in heparinzed tubes, then the serum were separated and part of it used immediately for glucose determination according to method of Teuscher and Richterich (1971). The rest of serum was kept frozen for determination of other blood parameters. The total cholesterol and triglycerides concentrations were determined enzymatically using kits from Boehringer (Germany) according to method given by Fossati and Prencipe, 1982 and Allain *et al*., 1974 respectively. Serum High-density Lipoprotein (HDL) cholesterol was determined by a direct method according to recent method given by Hino *et al*., 1996, while the Very Low Density Lipoprotein cholesterol (VLDLc) and Low Density Lipoprotein cholesterol (LDLc) were calculated by the formula given by Friedewald *et al*., 1972. The Blood Urea Nitrogen (BUN), Creatinine, albumin, total protein were determined by calorimetric methods according to Tabacco *et al*., 1979; Rock *et al*., 1983 and Dacie and Lewis, 1998, total billirubin (Reitman *et al*., 1957), calcium (Gindler and King, 1972) and iron (Fabre *et al*., 1954).

Statistical analysis: Data analysis was performed using the Statistical Package for the Social Sciences software (SPSS, version 11.0). Descriptive statistics were adopted to display data in means±SD. The statistical method of one way analysis of variance (ANOVA) and LSD were used to compare the mean values obtained among the different groups. Differences were considered significant whenever the p-value is $p<0.05$.

RESULTS

As shown from (Table 2) the seeds of Samh is rich in protein (22.3±2.1 g/100 gram) and contain considerable amount of fats (5.20±0.23 g/100 gram).

Results of (Table 3) showed that weight gain of control group was the highest, followed by rats fed 5% Samh (117.0±33.2 g) and rats fed 15% Samh (87.4±19.1 g), while the lowest weight gain was among rats fed 15% Samh and HL diet (57.2±12.3 g). As for food intake, there were no significant differences between daily amount eaten by all studied rats and the values ranged from 14.0±3.5 g/day for rats fed HL diet to 17.0±2.3 g/day for rats fed 15% Samh. Regarding waste food, it was clear that the highest wastes were among rats fed all HL diets.

Results of Table 4 shows that the mean values of serum glucose of rats of control group and rats fed 5% Samh (4.88±1.34 and 4.88±1.21 mg/dl respectively) were the lowest, while the mean value of rats fed 15% Samh (6.23±0.80 mg/dl) was the highest and followed by rats fed HL diet (5.73±1.72 mg/dl). Also, the mean value of BUN for rats fed 5% Samh (5.13±0.90 mg/dl) was the lowest followed by rats fed 5% and HL diet (5.88±1.76 mg/dl), while the mean value of rats fed HL diet (8.78±1.45 mg/dl). On the other hand, the serum creatinine value of rats fed 15% Samh was the lowest (26.33±5.51 mg/dl) followed by rats fed 15% Samh and HL diet (27.00±5.29 mg/dl), while the mean value for control group and rats fed 5% Samh (41.80±3.03 and 39.75±5.91 mg/dl) were the highest. It is clear from the

Table 2: Proximate chemical composition of Samh seeds flour (g/dry weight)

	Moisture Mean±SD	Ash Mean±SD	Protein Mean±SD	Fat Mean±SD	Carbohydrate* Mean±SD
Samh Seed Flour	7.42±0.36	2.87±0.14	22.3±2.1	5.20±0.23	62.2±5.6

SD: Standard Deviation *Calculated by difference

Table 3: Mean and standard deviation of weight and food intake of studied rats

	Control (n=6)	5% Samh (n=6)	15% Samh (n=6)	HL Diet (n=6)	5% Samh and HL Diet (n=6)	15% Samh and HL Diet (n=6)
	Mean±SD	Mean±SD	Mean±SD	Mean±SD	Mean±SD	Mean±SD
Weight gain (g)	137±39.8	117.0±33.2	87.4±19.1	67.4±26.9	66.8±16.1	57.2±12.3
Food intake (g/day)	15.8±3.5	16.8±2.8	17.0±2.3	14.0±3.5	15.2±3.7	14.4±3.2
Waste food (g/day)	4.1±3.5	3.1±2.8	2.9±2.3	5.9±3.1	4.7±3.7	5.6±3.2

SD: Standard Deviation HL: Hyperlipidemic NS: Not Significant *p<0.05 and **p<0.01

Table 4: Mean and standard deviation of serum glucose, bun, creatinine, albumin, total protein, total bilirubin of studied rats

	Control (n=6)	5% Samh (n=6)	15% Samh (n=6)	HL Diet (n=6)	5% Samh and HL Diet (n=6)	15% Samh and HL Diet (n=6)	-------- ANOVA -------	
	Mean±SD	Mean±SD	Mean±SD	Mean±SD	Mean±SD	Mean±SD	F. value	Sig.
Glucose (mg/dl)	4.88±1.3	4.88±1.2	6.23±0.80	5.73±1.72	5.60±0.3	5.43±0.7	0.79	0.571^{NS}
BUN (mg/dl)	6.96±1.7	5.13±0.9	6.93±1.1	8.78±1.5	5.88±1.8	6.43±2.1	2.44	0.074^{NS}
Creatinine (mg/dl)	41.80±3.0	39.75±5.9	26.33±5.5	36.75±3.3	35.25±7.9	27.00±5.3	5.78	0.002**
Albumin (g/dl)	9.00±1.6	10.25±1.7	8.33±1.5	7.75±1.0	10.0±1.4	9.25±1.0	1.83	0.158^{NS}
Total Protein (g/dl)	63.60±3.8	68.50±1.0	61.67±6.7	60.75±4.9	68.00±1.4	68.25±2.9	3.45	0.023*
Total Bilirubin (mmol/L)	2.00±0.7	2.25±0.5	2.33±0.6	2.73±0.6	2.03±0.9	1.50±0.6	1.36	0.29

NSn: number of rats, SD: Standard Deviation HL: Hyperlipidemic NS: Not Significant *p<0.05 and **p<0.01

same Table 4 that the higher Samh concentration, the lower the serum albumin concentration, where the mean value of rats fed HL diet and rats fed 15% Samh was the lowest (7.75±0.96 and 8.33±1.53 g/dl respectively) while the men value rats fed 5% Samh and rats fed 5% Samh and HL diet were the highest (10.25±1.71 and 10.00±1.41 g/dl respectively). In parallel with albumin results the mean value of serum total protein of rats fed 15% Samh and HL diet were the lowest (61.67±6.66 and 60.75±4.86 g/dl respectively) while the mean value of rats fed 5% Samh, 15% Samh and HL diet and 5% Samh and HL diet (68.50±1.00, 68.25±2.87 and 68.00±1.41 g/dl respectively) were the highest. Finally the mean value of total bilirubin of rats fed 15% Samh and HL diet was the lowest (1.50±0.58 mg/dl) while the mean value of rats fed HL diet was the highest (2.73±0.64 mg/dl).

Results of Table 5 shows that the mean values of serum cholesterol of rats fed 15% Samh and control group (1.70±0.30 and 1.76±0.17 mg/dl respectively) were the lowest, while the other values were similar and ranged from 2.13±0.47 of rats fed HL diet to 2.18±0.34 or rats fed 5% Samh and HL diet. In addition the triglycerides values of rats fed 15% Samh was the lowest (0.76±0.14 mg/dl) while the mean values of rats fed 5% Samh and 5% Samh and HL diet (1.35±0.52 and 1.31±0.09 mg/dl respectively) were the highest. The results of the same table showed that, in parallel with serum cholesterol level, the HDLc of control group and rats fed 15% Samh were the lowest (0.35±0.04 and 0.47±0.10 mg/dl respectively), while the values of rats fed 5% Samh and HL diet was the highest (0.60±0.11 mg/dl). Furthermore, the values of VLDLc of rats fed 15% Samh and HL diet were the lowest (0.15±0.03 and 0.18±0.13 respectively mg/dl), while the other values ranged from 0.23±0.16 mg/dl to 0.27±0.10 mg/dl. Although the data of LDLc seemed inconsistent, but it revealed that rats fed 15% Samh had the lowest value (1.08±0.20 mg/dl), while the higher values was observed among rats fed HL diet (1.46±0.54 mg/dl).

Results of Table 6 shows that the mean values of serum calcium of rats fed 15% Samh and 5% Samh and HL diet were slightly the highest (2.49±0.11 and 2.39±0.09 mg/dl respectively), while the other values were ranged from 2.15±0.35 mg/dl of rats fed HL diet to 2.27±0.10 mg/dl or rats fed 15% Samh. Regarding serum iron, the results showed that rats fed 15% Samh either alone or with HL diet had the highest values (32.67±2.08 and 32.25±5.62 mcg/dl respectively), while the mean values of control group and rats fed 5% Samh and HL diet was the lowest (24.0±8.80 mcg/dl and 24.25±3.86 mcg/dl respectively).

DISCUSSION

The results revealed that the seeds of Samh is rich in protein and therefore could be considered as a promise source for protein especially in developing countries as mentioned by Al-Jasser *et al*., 1995 and Al-Drewish, 2005. Moreover, some researchers like Mustafa *et al*., 1995, used Samh flour in bakery products and bread. Our results demonstrated that the lowest the intake from Samh the lower the blood glucose concentration, where the values of serum glucose of rats fed 5% Samh were the lowest, on the other hand the value of rats fed 15%

Table 5: Mean and standard deviation of weight and food intake of studied rats

	Control (n=6)	5% Samh (n=6)	15% Samh (n=6)	HL Diet (n=6)	5% Samh and HL Diet (n=6)	15% Samh and HL Diet (n=6)	------- ANOVA --------	
	Mean±SD	Mean±SD	Mean±SD	Mean±SD	Mean±SD	Mean±SD	F. value	Sig.
Cholesterol (mg/dl)	1.76±0.2	2.15±0.53	1.70±0.30	2.13±0.47	2.18±0.34	2.18±0.22	1.50	0.24^{NS}
Triglycerides (mg/dl)	1.28±0.6	1.35±0.52	0.76±0.14	0.92±0.66	1.31±0.09	1.15±0.80	0.65	0.66^{NS}
HDLc (mg/dl)	0.35±0.04	0.50±0.15	0.47±0.10	0.49±0.06	0.60±0.11	0.51±0.06	3.46	0.02*
VLDLc (mg/dl)	0.26±0.12	0.27±0.10	0.15±0.03	0.18±0.13	0.26±0.02	0.23±0.16	0.65	0.66^{NS}
LDLc (mg/dl)	1.16±0.17	1.38±0.37	1.08±0.20	1.46±0.54	1.32±0.28	1.43±0.30	0.81	0.55^{NS}

SD: Standard Deviation HL: Hyperlipidemic NS: Not Significant *p<0.05 and **p<0.01

Table 6: Mean and standard deviation of weight and food intake of studied rats

	Control (n=6)	5% Samh (n=6)	15% Samh (n=6)	HL Diet (n=6)	5% Samh and HL Diet (n=6)	15% Samh and HL Diet (n=6)	-------- ANOVA --------	
	Mean±SD	Mean±SD	Mean±SD	Mean±SD	Mean±SD	Mean±SD	F. value	Sig.
Serum Calcium (mg/dl)	2.17±0.38	2.49±0.11	2.27±0.10	2.15±0.35	2.39±0.09	2.27±0.10	1.20	0.35^{NS}
Serum iron (mcg/dl)	24.0±8.80	31.25±5.91	32.67±2.08	29.00±6.68	24.25±3.86	32.25±5.62	1.62	0.21^{NS}

SD: Standard Deviation HL: Hyperlipidemic NS: Not Significant *p<0.05 and **p<0.01

Samh was the highest. However it is documented that dietary fibers decrease blood glucose and according to Najib *et al*., 2004, the Samh seeds are rich in dietary fiber (10.6%). But this role of dietary fibber wasn't ascertain in Samh seeds where the lower amount intake had favourable effect than higher amounts. In parallel the lower amounts intake from Samh seeds had favourable decrement effects on BUN. On the other hand the higher intakes from Samh seeds decrease the concentration of serum creatinine albumin and total protein. However, these inconsistent results could be attributed to its content from anti nutritional factors that may have negative effect on albumin and total protein.

the results illustrated that higher intakes from Samh seeds decreased concentration of serum cholesterol, triglycerides and LDLc even with high intake from dietary fats and cholesterol. These findings could be attributed to the amount of dietary fiber occurred in Samh seeds. Where numerous studies (like Haidong *et al*., 2007 and Newby *et al*., 2007) proved that dietary fiber decrease the blood lipids among normal and hyperlipidemic patients. Finally, the higher the intake from Samh seeds-even with HL diet-the higher the serum concentration of calcium and iron.

Conclusion: It could be concluded from this study that Samh seeds is rich source for protein and could be used for producing high protein bakery products. Also, the high intake from Samh seeds decreased glucose, cholesterol, triglycerides and LDLc concentration in serum even with high dietary intake from fats and cholesterol. However, more researches are needed to clarify the effect of Samh seeds on human health.

REFERENCES

Al-Jasser, M.S., A.I. Mustafa and M.A. Al-Nawawy, 1995. Studies on Samh seeds growing in Saudi Arabia: 2 Chemical composition and microflora of Samh seeds. Plant Foods and Human Nutr., 48: 185-192.

Al-Nozaha, M.M., 2002. Cardiovascular Diseases and Risk its Factors. The 8th Meeting, King Abdual Aziz City for Sciences and Technology.

Al-Sharari, S.A., 1988. Samh Book. Al-Farazdeq Commercial Press. Riyadh, KSA.

Al-Drewish, F.S., 2005. The Effect of Different Treatments on Chemical and Biological Properties of Samh Seeds Flour Growing in Nortern Saudi Arabia. MS Thesis, King Saud University. KSA.

Allain, C.C., L.S. Poon, W. Richmond and P.C. Fu, 1974. Enzymatic determination of total cholesterol in plasma. Clin. Chem., 470-475.

AOAC, 1995. Official Methods of Analysis. Association of Analytical Chemists.16th Ed. Washington, D.C. USA.

Dacie, A. and J. Lewis, 1998. Practical Hematology. Churchill Livings, pp: 50-65, Tone. New Yourk.

Fabre, K., R. Trahaut and A. Singerman, 1954. Determination of trace elements in biological materials by flameless atomic absorption spectrophotometer. Ann. Pharm. Franc, 12: 409.

Fossati, P. and L.L. Prencipe, 1982. Serum triglycerides determined colorimetrically with an enzyme that produces hydrogen peroxide. Clin. Chem., 28:2077-2080.

Friedewald, W.T., R.I. Levy and D.S. Fredrickson, 1972. Estimation of the concentration of low-density lipoprotein cholesterol in plasma, without use of the preparative ultracentrifuge. Clin. Chem., 18: 499-502.

Gindler, M. and J.D. King, 1972. Chemical method for determination of calcium in serum. Am. J. Clin. Path., 58: 376.

Haidong, K., S. June and H. Gerardo, 2007. Dietary fiber intake and retinal vascular caliber in the Atherosclerosis Risk in Communities Study. Am. J. Clin. Nutr., 86: 1626-1632.

Hino, K., M. Nakamura, K. Nakanishi and M. Monabe, 1996. A new method for the homogenous assay of serum HDL-Cholesterol. Clin. Chem., 42: 299-302.

Mustafa, A.I., M.S. Al-Jasser, M.A. Al-Nawawy and S.E. Ahmed, 1995. Studies on samh seeds growing in Saudi Arabia: Utilization of Samh seeds in bakery products. Olant Food Hum. Nutr., 48: 279-286.

Najib, H., M.N. AL-Dosari and M.S. AL-Wesali, 2004. Use of Samh seeds in the laying hen diets. Int. J. Poult. Sci., 3: 287-294.

Newby, P.K., M. Janice and B. Peter, 2007. Intake of whole grains, refined grains and cereal fiber measured with 7-d diet records and associations with risk factors for chronic disease. Am. J. Clin. Nutr., 86: 1745-1753.

Reeves, P.C., F.H. Nielson and G.C. Fahey, 1993. AI-93 purified diets for laboratory rodents: Final report of the American Institute of Nutrition Ad Hoc Writing Committee on the reformulation of the AIN-76A rodent diet. J. Nutr., 123: 1939-1951.

Reitman, J., S. Frankel and J. Amer, 1957. Chemical Kits. Clin. Path., 28: 56.

Rock, R.C., W.G. Walk and D.C. Jennings, 1983. Nitrogen metabolites and renal function. In: Fundamentals of Clinical Chemistry. Tietz, N W (Ed). 3rd Ed, W.B. Saunders Company. Philadelphia, pp: 679-684.

Showdrei, S.A., 1999. Vascular Plants In Kingdom of Saudi Arabia. National King Fahad Library, Riyadh, KSA.

Tabacco, A., F. Meiattini, E. Moda and P. Tarli, 1979. Simplified enzymatic/colorimetric serum urea nitrogen determination (letter). Clin. Chem., 25: 336-337.

Teuscher, J. and P. Richterich, 1971. Enzymatic Method of Glucose. Schaveiz Med. Wschr, 101: 345-390.