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Research Article

Study of effect of different cooking methods on anti-nutritional factors in chick Pea (Cicer *arietinum* L.)

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Abstract

The Chick Pea is an important and chief source of proteins in Indian diet. About 75% of worlds chick pea production is in India (Chavan, J., S. Kadam, and D. Salunke 1986).The discussed theory was regarding the nutritional quality of proteins of Chickpea. Raw and treated seeds with different kinds of cooking method we used for study, their content of anti nutritional factors including trypsin and and chymotrypsin inhibitors. Different cooking method included in the present study were soaking ,boiling, cooking, roasting ,microwave cooking and autoclaving.

INTRODUCTION:

Food contains carbohydrates, fats, proteins, minerals and vitamins which provide energy and nutrition to the living organism. The energy used to perform all conscious as well as involuntary actions of body. Nutrients are used as building blocks for growth and tissue replacement (Deshpande S.S. 1992). Plants provide over 80 percent of food which human consume daily. Protein is an important factor of the living organism which plays structural as well as functional role. It is a major constituent of all organisms are account for more than half the dry weight of the living substance of most cells

we know that legume seeds contain high level of proteins vitamins minerals and calories (Hulse, J. H. 1991). there limitations to their use in food because of anti-nutritional facts actors these are trypsin inhibitors and chymotrypsin inhibitors, flatulins, phytic acid lectin tannins.

Chick pea *Cicer arietinum* L.is an important and chief source of proteins in Indian society. About 75% of worlds chick pea production is in India (Chavan *et al.*, 1986). The discussed study was regarding the antinutritional factors of proteins of chick pea. Raw and treated seeds with different kinds of cooking methods were used for study their content of antinutritional factors including trypsin and chymo trypsin inhibitors. The cooking methods viz were soaking, boiling, cooking, roasting, microwave cooking and autoclaving were implemented here (Mansour, 1996; Khattab and Arntfield, 2009).

MATERIALS AND METHODS:

The seed material of a varieties of chick pea (C*icer arietinum* L.) Var. BDN 9-3 and PG-5 were used in the present studies.

PHYSICAL TREATMENTS:

Physical treatments are used as per Khattab R. Y. and Arntfield S.D. (2009).

Soaking: -

Seeds were soaked in the water for 24 h until reaching maximum seed weight and hydration. Ratio of seed to water was 1:5(w/v).

Boiling: -

Seeds were kept in boiling water until seeds become soft and tender for 30-35 min as in ordinary cooking. Ratio of seed to water was 1:5(w/v).

Roasting: -

Seeds were kept in sand and roasted at the tem.180^{O} C for 15 min.

Autoclaving:-

Seeds were placed in autoclave with five times their weight of distilled water at 15 lb pressure for 20 min.

Microwave cooking:-

Seeds were kept in a container with water and cooked in a microwave oven for 15 min.

ESTIMATION OF CRUDE SEED PROTEINS:

The crude protein content of seeds of M_3 mutants of winged bean was estimated by Microkjeldahl method.

The dry defatted seed powder weighing 300 mg, was digested with 7.5 ml of concentrated sulphuric acid (H_2SO_4) in presence of a catalyst. The sample was heated for about 8hrs until the mixture became clear. The digested material was diluted upto 40ml in volumetric flask with distilled water.The distillation was carried out by using the Markham's steam distillation apparatus. The amount of nitrogen content was calculated. The crude protein content was worked out by multiplying the value of nitrogen content by 6.25.

2) EXTRACTION AND ESTIMATION OF SEED PROTEINS:

The healthy, mature seeds were used for the extraction of proteins. The seeds were ground in mortar and pestle to make a fine powder. This fine seed powder was defatted with hexane. After defatting the fine powder it was air dried and extracted in six volumes of distilled water. The suspension was centrifuged for 30 minutes. The clear supernatant was collected and used for protein estimation. The protein content was estimated according to Biuret method (Layne, 1957). The protein value was expressed as mg/gm of defatted seed powder

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3) ENZYME INHIBITOR ASSAY:

According to trypsin assay, 20 mg of trypsin was found to be optimum for further experimentation. Trypsin inhibitor activity was determined by mixing suitable quantity of protein extract containing inhibitor with 20 mg of trypsin in a volume of 300 ml of (0.05 M Tris-HCI buffer P^H 8 containing 1 mM $CaCl_2$), so that trypsin activity could get inhibited upto 40% to 60%. 1 ml of 1mM BAPNA (N-a-benzoyl DL-arginine-p-nitroanilide) was added to the reaction mixture and incubated at room temperature. Later the reaction was stopped after 10 minutes by adding 200 ml of 30% acetic acid. The residual trypsin activity was measured at 410 nm on UV-1700 Shimadzu spectrophotometer. The chymotrypsin inhibitory activity by using GLUPHEPA as a chromogenic substrate. Both trypsin and chymotrypsin were assumed to be 100% active (Erlanger *et al*., 1961,Mueller and weder 1989).

RESULTS AND DISCUSSION :

Proteins are indispensable part of life. It plays an important role in the structural build up and different biochemical reactions taking place in the living creatures by its enzymatic activities. In plants , legume is an important group which produces seeds having high amount of proteins. But Food legumes contains antinutritional factors like protease inhibitors. Protein inhibitors of proteinase are ubiquitous. Presence of protease inhibitors in plants was recognized by Read and Hass in (1938) Belitz H. D. and Weder J. K. P. (1986). Liener (1962) recognized that the nutritive value and the protein digestibility of legumes would always be very poor unless subjected to cooking or heat treatment. The adverse dietary effects of these inhibitors have been studied by many workers (Liener and Kakade, 1980, Gunn *et.al* , 1980; Krogdahl and Holm, 1981 and Higuchi *et.al* , 1983).

CTI and TI are very stable molecules.. Liener (1986) has shown the effects of raw soybean which makes the pancreatic hypertrophy and hyperplasia in rats. The winged bean contains a specific chymotrypsin inhibitor (CTI) and the Trypsin inhibitor (TI). Although these proteolytic have too many negative attributes their role in plants own defense is considerably more important.

Chick pea *Cicer arietinum* L.is an important and chief source of proteins in Indian society. The discussed study was regarding the antinutritional contents of proteins of chick pea. Raw and treated seeds with different kinds of cooking methods were used for study their content of antinutritional factors.

Hence in present study the different cooking methods were considered as a way to reduce these antinutritional factors as it is also proved by Mansour E. H. (1996) , Khattab and Arntfield (2009). In present study estimation of Crude protein , extractable/soluble protein ,trypsin inhibitor and chymotrypsin inhibitor were done.

In estimation of crude seed protein it was observed that content of crude protein in seed meal doesn't affect by different cooking methods. In chick pea Var. BDN 9-3 highest in Boiling 23.75% and lowest in Microwave 22.30%, while in var. PG-5 it was highest in Soaking 26.10% and Microwave 24.86% shown lowest.

Table 1: Crude Protein content of Control and treated seeds of Chick pea (C*icer arietunum* L.) Var. BDN 9-3

Treatment	Crude Protein%
Control	23.85
Soaking	22.65
Boiling	23.75
Roasting	22.44
Autoclaving	22.60
Microwave	22.30

Table 2: Extractable Seed Protein content(soluble) of Control and treated seeds of Chick pea var. BDN 9-3..

Treatment	Protein mg/gm seed meal
Control	73.45
Soaking	71.65
Boiling	71.27
Roasting	68.75
Autoclaving	67.35
Microwave	67.75

Table 3 : Extractable Seed Protein content(soluble) of Control and treated seeds of Chick pea var PG-5.

Treatment	Protein mg/gm seed meal
Control	69.45
Soaking	67.66
Boiling	67.15
Roasting	68.51
Autoclaving	66.60
Microwave	66.45

Table 4: Crude Protein content of Control and treated seeds of Chick pea (C*icer arietunum* L.) Var. PG-5

Treatment	Crude Protein%
Control	26.10
Soaking	26.10
Boiling	25.40
Roasting	25.60
Autoclaving	25.86
Microwave	24.86

Table 4: Trypsin inhibitor content in seeds of Chick pea (C*icer arietunum* L.) Var. BDN 9-3

Sr. no.	Treatment	Trypsin inhibitor content TIU/mg protein
1	Control	23.40
3	Soaking	21.51
4	Boiling	19.90
5	Roasting	22.21
6	Autoclaving	19.33
7	Microwave	20.30

Table 5: Trypsin inhibitor content in seeds of Chick pea (C*icer arietunum* L.) Var. PG-5

Sr. no.	Treatment	Trypsin inhibitor content TIU/mg protein
1	Control	22.18
3	Soaking	20.54
4	Boiling	18.95
5	Roasting	19.67
6	Autoclaving	17.26
7	Microwave	18.27

Table 6: Chymotrypsin inhibitor content in seeds of Chick pea (C*icer arietunum* L.) Var. BDN 9-3

Sr. no.	Treatment	Chymotrypsin inhibitor content CTIU/mg protein
1	Control	93.51
3	Soaking	91.42
4	Boiling	90.93
5	Roasting	92.66
6	Autoclaving	87.21
7	Microwave	91.75

Table 7: Chymotrypsin inhibitor content in seeds of Chick pea (C*icer arietunum* L.) Var. PG-5

Sr. no.	Treatment	Chymotrypsin inhibitor content CTIU/mg protein
1	Control	88.12
3	Soaking	87.55
4	Boiling	86.88
5	Roasting	85.33
6	Autoclaving	83.90
7	Microwave	85.33

Extractable protein content also show positive trends in all cooking methods. chick pea var. BDN 9-3 soaked seeds 71.65 shown highest value and the lowest was in autoclaved seeds 67.35while in var. PG-5 roasted seeds 68.51 shown highest value and the lowest was in microwave 66.45 mg/gm.

Trypsin inhibitor content show decline in the boiling and autoclaving . In chick pea var. BDN 9-3 Autoclaving 19.33 TIU/mg lowest and highest in Roasting 22.21 TIU/mg whereas in PG-5 the lowest was in Autoclaving 17.26 TIU/mg and highest was in Boiling 21.14 TIU/mg.

In chymotrypsin inhibitor content variations are occurred in different cooking methods. In chick pea var. BDN 9-3 Autoclaving 87.21 CTIU/mg lowest and highest in Roasting 92.66 CTIU/mg whereas in PG-5 the lowest was in Autoclaving 83.90 CTIU/mg and highest was in soaking 87.55 CTIU/mg.

It shows autoclaving is the method which works better than other. Boiling is one of the cooking method which reduces chymotrypsin inhibitor content.

The results show considerable reduction in the protease inhibitors. Cooking methods imparted in the study were revealed effective reduction in the protease inhibitors.

Water Boiling and Autoclaving are the most successful treatments and they shown lowering down the activities of trypsin and chymotrypsin inhibitors. More study is necessary to study the effect of these cooking methods on quality of protein.

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