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Research Article

Sweet lupine recipe development and nutritional content of recipe at Holeta, Ethiopia

Abstract

Legumes plants are important source of protein. Sweet lupine is one of the legumes plant which is protein and mineral source. In this study sweet lupine were prepared in different common Ethiopian food preparation methods in the form of cooked food (Nefro), Roasted food (Kolo) and Shero. The nutritional content of the recipe and grain sample were analyzed using official methods. The nutritional content of the recipe Shero have higher protein content (34.6%) than cooked food (Nefro 30.22 %) and Roasted food (Kolo 30.12 %). Zinc content (12mg/100g) and iron (21mg/100g) content were higher for Nefro recipe were as potassium and sodium were higher for shero. The result of sensory acceptability and nutritional content of shero recipe were higher which indicates by eating shero in the daily meal protein and micronutrient (Fe &Zn malnutrition problems of the society can be eliminated.

Introduction

Legumes plants are important in human protein nutrition. Sweet lupine is one of the legumes plant. The protein content of the sweet lupine close to 35 %. The protein content increase or decrease by different processing methods. The protein quality of a food can be predicted based on its amino acid composition and protein digestibility [1]. It is important to consider not only the total amount of protein but also the amino acid composition. Sweet lupine has low sulphur amino acid content [2]. The oil content of lupin is much lower than that of soya. Lupinus albus has approximately 11 % lipids while other species have less than 6 %, however L. Mutabilis may have up to 20 %. This is similar to soya and is 2-3 times the oil content of other legumes [1]. The main advantages of lupine use relative to other legumes used in human nutrition relate to their high protein content; although deficient in sulphur amino acids lupin protein is complementary to cereal proteins thus the mix will be of higher biological value [3]. Lupins have twice as much protein as beans, chick peas, lentils and other legumes. Sweet lupin seeds can be consumed directly after cooking or deep frying in a variety ways [4].

Dieticians and medical scientists in Europe and Australia are researching the health benefits of Australian sweet lupine, which has a low glyceamic index and could potentially play a role in combating obesity and its associated health problems of diabetes and heart disease.

Other possible health benefits of eating the lupin include a more balanced blood glucose level, a lowering of cholesterol and improved bowel health. found that eating white bread enriched with the kernel flour of Australian sweet lupine significantly reduced blood glucose and insulin responses compared to those eating plain white bread [5].Sweet lupin flour (33%) blended with oat (25%) and wheat flour (16%) with minimal amounts of whey milk protein (5%) and sucrose (22%) has been used during the nutritional recovery of malnourished infants [6]. Therefore in addition to the recipe developed and nutrient analysis common Ethiopian food shero, cooked food (Nefro) and Roasted food (Kolo) Additional research efforts have been directed at testing the incorporation of sweet lupine flour to commonly consumed foods, such as bread, crackers or pasta.

Materials and Methods

The sweet lupine, sample was collected from highland pulse breeding Holeta Agricultural Research Center. The recipes were prepared according to the Ethiopian traditional food recipe development procedure.

Sample preparation: Sweet lupine sample were graded, sorted and cleaned manually. Sweet lupine flour preparation: the sweet lupine was soaked overnight. After soaking the sample were dried in sunlight and the sweet lupine were crashed into single cotyledons.

Cooked Food (Nefro): The sweet lupine samples were socked for overnight at room temperature with 200g sample socked with one liter of water. The socked samples were cooked by adding enough water using heat until it will become ready to eat.

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Roasted Food (Kolo): 500 gram of the sweet lupine samples was soaked overnight. The socked samples were Roasted using heat until it will become ready to eat.

Shero: The sweet lupine was soaked overnight. After soaking the sample were dried in sunlight and roasted the sweet lupine, crashed into single cotyledons and milled to prepare shero flour.

Composition study: Nutritional studies were conducted by following standard methods.

Protein content

The protein content of the sweet lupin from each was determined by Kjeldahl method as stated in the [7]. Method 46-11. One gram ground sample were measured and transferred into completely dry kjeldhal flask. Ten gram of kjeldhal tablet was added to the sample inside the flask. Twenty milliliter of 98% concentrated sulphuric acid was mixed with the sample. The sample digestion was started by connecting the kjeldhal flasks with the digestion rock. The digestion was completed when the brown color of the sample was completely disappeared. After the digested sample was cooled, 50 ml of distilled water and 70 ml of sodium hydroxide (32%) were added and distilled into 25 ml of excess boric acid containing 0.5 ml of screened indicator. The distillate was titrated with 0.1N hydrochloric acid to the red end point.

'Total nitrogen= (T-B) x 0.1401 /W

W is weight of the sample taken for analysis

T is volume of HCL used for titration

B is blank used as control

Crude protein (CP%) = N*6.25

Fat content by Nuclear magnetic resonance spectrophotometer (NMR)

Twenty two (22) gram of the sample were measured and dry in to oven at 105 Degree centigrade for three hours and cool in adisicator for 30 minute. After cooling the tube were inserted in to NMR and directly measure the fat content.

Mineral content

Recipes mineral contents of Ca, Fe, Na, K and Zn were determined using Atomic Absorption Spectrometer

Sample preparation for Atomic Absorption spectroscopy (AAS) – (AOAC, 1984)

0.5 gram of grinded samples was weighed. The samples were ashed at 550 degree centigrade for 3hrs in muffule furnace. After cooling the ashed sample were mixed with 2.5ml distilled water and 2.5 ml conc. HCL. The digested sample were filtered and marked with 100ml volumetric flask. The aliquot were measured using AAS.

Concentration (minerals in mg/100g) = concentration reading by AAS X dilution factor X 10/ weight of sample

Sensory Evaluation: The recipes were coded and randomly presented to 20 panelists in random order. In sensory evaluation five point hedonic scale (1= dislike very much, 2= dislike, 3= neither like nor dislike, 4= like, 5= like very much) were used.

Experimental Design and Data Analysis: The experiments were designed in completely randomized design (CRD). The analyses of variance (ANOVA) were performed to examine the significance level of all parameters measured. Least Significant Difference (LSD) test was used for means comparison by SPSS Version 23.

Result

Macro nutrients (Protein and Fat)

Protein: The results of the chemical compositions of the recipes and the grain are presented in table 1. The recipe shero have high protein content (34.65%) compared to other recipe and the grain protein content. Lupine seeds have a relatively stable composition, although cultivation conditions can modify the composition. Larger and fuller seeds have more protein and less crude fiber. During industrial processing dehulling reduces the fiber while increasing protein content [8]. In this study dehulling and different processing method increase and decrease the protein content compared to the grain protein content from 31.65% - 34.65%. Compared to the field pea variety the sweet lupine has greater protein than the field pea protein content. The protein content of shero recipe higher this is good solution to combat the protein malnutrition problem of the society in Ethiopia.

Fat content: The oil content of the sweet lupine recipes range from 7.75-8.5%.The oil content of lupin is much lower than that of soya [9]. Lupinus albus has approximately 11 % lipids while other species have less than 6 %, however L. mutabilis may have up to 20 %. This is similar to soya and is 2-3 times the oil content of other legumes [10].In this study the oil content of the recipes were not significance difference.

Micronutrients (Fe, Zn, Ca, K and Na)

Legumes are very important mineral sources for human nutrition. The sweet lupine recipe Zn, Fe, Ca, K and Na content were ranged from 8-12 mg/100g, 3.5-21 mg/100g, 27-94mg/100g, 29-82 mg/100g, 1-2.5 mg/100g respectively. Zn, Fe and Ca content of coked product (Nefro) have greater values compared to other recipe where as potassium and sodium content of the recipe shero have higher than the other recipe. Compared to the field pea (Bursa variety) the entire recipe has good zinc and calcium content as well as comparable iron, potassium and sodium content (Table 2).

Table 1: Macronutrient composition (Protein and Fat content) sweet lupine (Wolela Variety) recipe Ethiopian Food compared to Field pea variety (Bursa).

Recipes and grain	Protein Content	Fat Content
1.Shero	34.65 ± 0.00^{a}	7.75 ± 0.07^{b}
2.Nefro(cooked food)	30.22 ± 0.035^{c}	8.35 ± 0.07^{a}
3.Kolo(Roasted Food)	30.12 ± 0.17^{c}	8.5 ± 0.14^{a}
4.Sweet Lupine grain	31.65 ± 0.00^{b}	8.3 ± 0.00^{a}
5.Bursa (Faba bean variety)	22.32 ± 0.00^{d}	3.6 ± 0.00^{c}

All results: mean ± standared Deviation

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Sweet lupine Iron (Fe) Content (3.5-21mg/100g) was in the range of world health organization in different age group. RDI for women (18mg/day), for men (8mg/day), for pregnant women (27mg/day) as well as Sensitive age group, pregenant women, preadolcent girl and infants.

Sweet lupine Zn (8-12mg/100g) content was in the range of world health organization in different age group. RDI for women (8mg/day) and for men (11mg/day).Similar study result shows the mineral content of Australian sweet lupine is between 3.2-4.6 g/100g dry matter. The calcium content ranged 15-29mg/100g, sodium content 3-11mg/100g. Potassium 66-90mg/100g, Iron 31-150mg/100g and Zinc 24-45mg/100g [11]. The result of the study shows in the range of the pervious study.

Sensory evaluation of the sweet lupine recipes

The recipe Shoro shows acceptable taste, color, Texture and all over acceptability compared to the other recipe. Next to shero Roasted food (Kolo) has acceptable sensory result than cooked Food (Nefro) in which the sensory evaluation evaluated by untrained twenty panelists and using five point hedonic scales (Figure 1). In this study all the recipes have good sensory Acceptability especially shero (Ethiopian Food) have high sensory score for all the sensory parameters.

Table 2: Micronutrient composition (Zn, Fe, Ca, K and Na (mg/g) content) sweet lupine (Wolela Variety) recipe compared to field pea variety (Bursa).

Recipes and grain	Zinc Content (mg/100g)	Iron Content (mg/100g)	Calcium Content (mg/100g)	Potassium (mg/100g) content	Sodium Content (mg/100g)
1.Shero	9.5 ± 0.002^{ab}	3.5 ± 0.005^{c}	27 ± 0.0014^{e}	82 ± 0.75^{b}	2.5±0.0021^{b}
2.Nefro	12.0 ± 0.0014^{a}	21 ± 0.012^{b}	94 ± 0.0014^{a}	18 ± 0.002^{b}	1.4 ± 0.007^{a}
3.Kolo	9.0 ± 0.0014^{ab}	20 ± 0.006^{b}	78 ± 0.0035^{b}	29 ±0.00^{b}	2.5±0.00071^{b}
4.Sweet Lupine	8± 0.00 ^{bc}	21 ± 0.00^{b}	69 ± 0.00^{c}	29 ± 0.00^{b}	1± 0.00^{b}
5.Field pea(Bursa)	5 ± 0.00c	5.2 ± 0.00^{a}	34 ± 0.00^{d}	224 ±0.00^{a}	20±0.00^{a}

All results: mean ± Standard Deviation

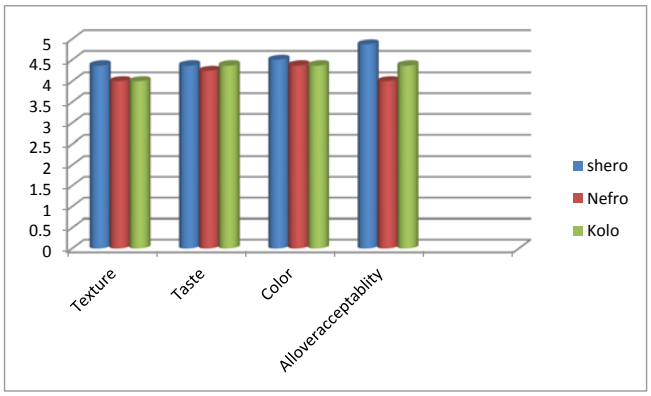

Figure 1: Sweet lupine Recipe sensory result using five point hedonic scales by 10 panelists.

Conclusion

The nutritional content and sensory acceptability point of view comparing the recipe of sweet lupine each other as well as field pea. The protein content, Fe, Zn, K, Ca, Na and sensory acceptability of shero and kolo is better to use sweet lupine as food and to combat protein and micronutrient malnutrition problems in Ethiopia compared to the other recipe and the field pea variety (bursa).

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