CHANGE IN ANTI-NUTRITIONAL & REDUCING SUGAR VALUE DURING GERMINATION IN SOME VARIETIES OF FINGER MILLET IN NEPAL

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INTRODUCTION

Nepal is an agricultural country as more than 80% of its population is involved in agriculture (Wikipedia, 2009). Finger millet (*Elusine coracana)*, locally called '*kodo*', is the fourth largest agricultural produce of Nepal after rice, maize and wheat. The annual production of finger millet alone is 200 thousand metric ton excluding other varieties of millet, 20 thousand metric ton. About half of the total quantity of finger millet grown in Nepal is used to derive fermented product, *jand* (Dawadi, 1999) and the rest is wasted as feed and in non–feed use. Finger millet is highly nutritious cereal and known mainly for its excellent calcium content, and other essential amino acids mainly methionine, which is deficient in most cereals including wheat and legume protein. Although finger millet contains less total protein (7.3%) than sorghum or wheat (11–12%), the biological value of protein is high.

Millet cannot be easily processed as other cereal grains thus it is mostly being used for beverage purposes and rest as a waste. Millet can be used in our diet but people usually prefer easily digestible product such as wheat, paddy, maize etc. The main factor for this is presence of anti–nutritional factors in millet which can have adverse effect on our digestibility and also can lead to health hazards.

If we compare the proximate composition of finger millet and rice the finger millet has got more micronutrient as compared to rice which can eventually help in minimization of micronutrient deficiency. The finger millet variety registered are given below:

Table 1 Variety registered year, production capacity & recommended areas of Nepal

Varieties of crop with local name	Registered Year	Prod. cap. (ton/hectors)	Recommended areas of Nepal
Kabre kodo–1	2047 B.S.	2.3	Mid hilly areas (900–1900)
Dalle–1	2037 B.S.	3.3	Mid hilly & inner terai
Okhale–1	2037 B.S.	3.3	Mid high attitudes areas

(Source: Hill Crops Research Programme)

Table 2: Comparative Study of proximate analysis

Proximate variables	Finger Millet	Rice
Moisture %	13.1	13.7
Protein gm	7.3	6.8
Fat gm	1.3	0.5
Minerals g	2.7	0.6
Fiber gm	3.6	0.2
Carbohydrate	72	78.2
Energy	328	345
Calcium	344	10
Phosphorous	283	160
Iron	6.4	3.1
Carotene	42	0
Thiamine	0.42	0.06
Riboflabin	0.19	0.06
Niacin	1.1	1.9
Vitamin C	0	0

Table 3 Production of finger millet in Nepal

Crops	Area (Hector)	Production (Tons)	Productivity (Tons/Hector)
Rice	15,600,044	4,216,465	2.7
Maize	824,525	1,484,112	1.8
Wheat	641,030	1,157,865	1.81
Finger millet	259,888	282,852	1.09
Barley	28,194	30,488	1.08
Total	3,313,681	7,171,782	

(Source Anon, 2003)

OBJECTIVES

To study the anti–nutritional and reducing sugar value change during the germination

MATERIALS AND METHODS

Six different variety of finger millet (Dalle, Kabre, Okhale, GPU–0025, GE–5016 and GE–0116) was collected from NHRS, Dolakha and following was done

CLEANING → **STEEPING** (1:3 finger millet:water for 24 hours & lighter particles were removed) → **SPREADING** (the finger miller was spread in a petri plate)

MOISTENING → **GERMINATION** → **DRYING** → **STUDY**

The determination of antinutritonal factors were done as per the method prescribed from Sadasivam S. and Manickam A., (1991) & Reducing sugar was measured as per the Rangana (2007). One way annova was done as statistical analysis with Microsoft Excel 2007.

RESULTS

Parameters	Sample	Dalle	GPU–0025	Kabre	Okhale	GE–0116	GE–5016
Tannin (mg% as tannic acid)	Raw	322.4^{a} (5.21)	288.6^{b} (3.13)	256.9^{c} (4.21)	242.45^{d} (4.24)	235.4^{e} (3.69)	212.4^{f} (3.24)
	Germinated	394.55^{g} (2.51)	372.58^{h} (4.07)	341.85^{i} (3.11)	285.65^{j} (4.17)	349.8^{k} (4.51)	326.4^{l} (3.51)
Phytic Acid	Raw	614.65^{a} (5.1)	526.35^{b} (5.09)	570.87^{c} (3.17)	549.81^{d} (4.11)	502.8^{e} (5.63)	615.2^{f} (4.83)
	Germinated	181.65^{g} (1.31)	144.2^{h} (1.94)	163.95^{i} (2.05)	158.86^{j} (2.43)	218.5^{k} (2.11)	230.6^{l} (3.03)
Total Oxalates	Raw	20.52^{a} (1.04)	22.84^{b} (2.17)	21.73^{c} (1.55)	21.15^{d} (1.07)	21.22^{d} (2.11)	22.47^{b} (2.03)
	Germinated	9.66^{ef} (1.31)	11.68^{g} (1.94)	9.87^{ef} (2.05)	10.60^{h} (2.43)	9.97^{e} (2.11)	9.43^{f} (3.03)
Total Polyphenols (mg% as gallic acid)	Raw	362.55^{a} (5.21)	372.1^{b} (3.52)	334.13^{c} (4.17)	351.00^{d} (3.83)	366.40^{e} (2.06)	377.80^{f} (4.16)
	Germinated	157.27^{g} (3.12)	179.07^{h} (2.48)	150.76^{i} (3.09)	157.27^{j} (3.11)	160.00^{k} (2.62)	130.20^{l} (2.11)
Total Flavonoids	Raw	145.45^{a} (1.43)	177.00^{b} (1.71)	100.47^{c} (2.18)	99.15^{d} (1.38)	93.10^{e} (2.10)	100.30^{c} (3.01)
	Germinated	113.30^{f} (0.95)	81.55^{g} (2.10)	84.50^{h} (1.36)	87.00^{i} (1.78)	82.93^{j} (2.10)	84.10^{h} (3.01)
Reducing Sugar (mg% as dextrose)	Raw	0.96^{a} (0.48)	1.51^{b} (0.36)	0.97^{a} (0.63)	0.76^{ac} (0.03)	1.25^{ab} (0.28)	1.34^{b} (0.05)
	Germinated	11.9^{d} (0.91)	18.32^{e} (0.08)	12.17^{f} (0.71)	9.66^{g} (0.31)	15.45^{h} (0.91)	16.10^{i} (0.09)

CONCLUSION

TGermination of finger millet seeds for 72 hours at 28±2° C had a significant effect on anti–nutritional factors of the grain. Phytic acid, total oxalates, total polyphenols and total flavonoids contents decreased by about 63.54%, 53.41%, 58.71% and 11.34% respectively after germination. While tannin content increased by about 33.21% on average for all six varieties. Reducing sugar significantly increased by about 13–15 fold which gives millet a sweet taste and adaptation of this technology can minimize the micro–nutritient deficiencies.

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