A STUDY TO INCREASE THE YIELD OF DURUM AND IMPROVE THE QUALITY OF PRODUCTS

Ts.Sansargerel[1], B.Bulgan[2], Ya.Azzaya[2], B.Purevjargal[3], Ya.Myagmarsuren[2]
[1]MULS, School of Agro ecology and Business, [2] Institute of Plant and Agriculture, [3]Darkhan MUST
agro.sansar@gmail.com

Abstract

In Mongolia, flour millers begin milling their high gluten wheat till mid-February and the start to impor high-gluten wheat from abroad. Therefore, it is imperative to mill the high quality wheat with low quality one.

Currently, there are no localized durum wheat variety. Flour mill and FSF /Farmers support fund/ are setting the wheat price based on its gluten, which increases interest to cultivate the durum wheat for farmers. Also, flour mills are interested in produce durum wheat products and it leads to tight collaboration with research institutes.

There are several complicated additional processes in milling durum wheat because it has less fiberglass than bread wheat. Presently, there are no factory line for milling the durum wheat and it causes the decrease in flour yield. Hence, it is essential to develop the technology to mill durum wheat.

According to our research, Sondor variety showed highest yield in treatment 2 with 79.8% flour yield and Khar Suvd had 81.5% flour yield in treatment with 20.5-hour rest. Comparing to bread wheat variety Darkhan 144, durum wheat's flour yield increased by 3.8-5.0%, namely have to add durum wheat in amount of 3% of total bread wheat.

Keywords

Semolina, moisture, grain, volume

Introduction

Durum wheat is one of the major source of calories, nutrition, especially, energy, carbohydrate and protein in many countries. 75-80% of endosperm is gluten and 8-20% is protein (McKevith 2004, Liu 2007). Also it contains vitamins, minerals and phytochemicals which are useful for human health and beauty.

Semolina is a type of flour that is typically made from hard durum wheat. It has high gluten, also rich in carbohydrate, protein, cellulose, iron and vitamin B complex. Likewise, effective in weight reduction, cardiovascular disease and supports digestion [1].

Nutritional value of dulum wheat depends on how it is processed and comparing to bread wheat it has high nutritional value [2].

Moreover, semolina is rich in cellulose which is beneficial to control blood sugar level after meal. As well helps to reduce the blood sugar level for diabetes [3].

Innovative aspects

This study becomes original study for researching about flour yield of new durum wheat varieties localized in Mongolia, feature of milling and improvement in baking process of bread wheat bread.

Objectives

Following objectives were set to determine the incensement of durum wheat flour and improvement of product quality. Herein:

1. To invent the suitable method of soaking grain for durum wheat flour yield
2. To determine the milling frequency of durum wheat
3. To determine the optimal supplement of durum wheat in bread wheat products.

Materials and methods

Mongolian new durum wheat variey, Khar Suvd and Sondor were compared by the method approved by academic council of Institute of Plant and Agriculture with bread wheat variety, Darkhan 144. And was done in Biochemistry-Technology laboratory of Institute of Plant and Agriculture, and Food chemistry, technology laboratory of Darkhan MUST.

Results

1. Study of soaking grain method in durum wheat yield

Before milling, grains were soaked according to Chopen's method in three ways [4].

Agreeing with Swin kunz's research, it is optimal to mill the grain with moisture of 16.0-17.5%. For humectation whole-wheat flour, have to rest 2-3 hours every percent of added water, for white flour 3-4 hours [5] /Table-1/.

Table 1.

Variants of the seed soaking experience

Treatments	1st humectation		2nd humectation		3rd humectation		Total hours of resting
	Moisture up to, %	Hour of resting	Moisture up to, %	Hour of resting	Moisture up to, %	Hour of resting	
Treatment 1	16.0-16.5	20	17.0-17.5	0.5	-	-	20.5
Treatment 2	13.5-14.0	20	16.0-16.5	4	17-17.5	0.5	24.5
Treatment 3	13.5-14.0	20	16.0-16.5	8	17-17.5	0.5	28.5

In our study, the flour yield of 20.5 hours rest was higher when milled after varieties Sondor 10.36% and Khar Suvd 12.6% had moisture content respectively added required water content and put 20.5, 24.5, and 28.5 hours./MRE $_{0,5}$ = 2,72%/ [6].

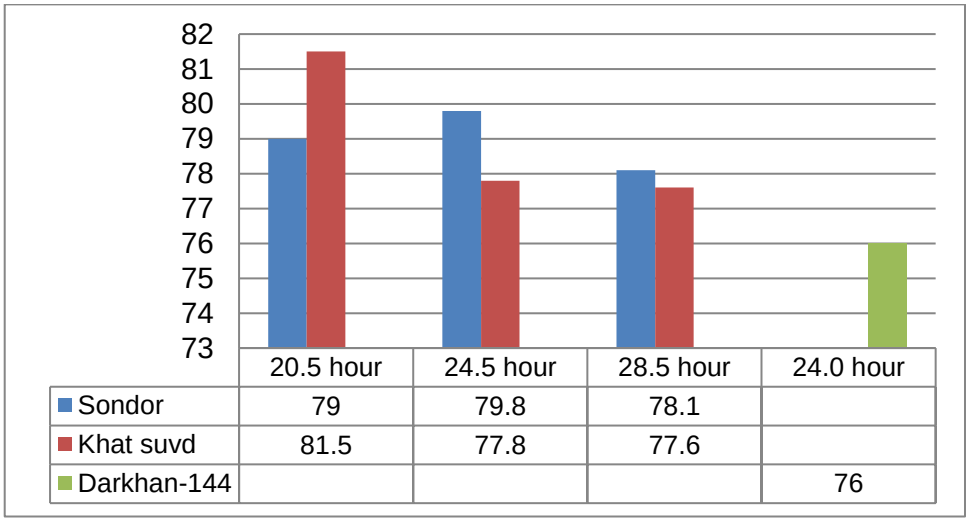

Figure1. Impact of period of soaking grain in yield of flour

The flour yield was likely to increase were slightly higher for varieties, with the Khar Suvd varieties (12.6% wet) for 20.5 hours and the Sondor varieties (10.56% wet) for 20.5-24.5 hours. Bread wheat varity Darkhan 144 had lower flour yield /76.0%/ than durum wheat after 24 hours' humectation.

According to Satake and Tkac, flour yield was 72% when durum wheat milled with 17.5% moisture for 4-5 times, whereas in our research yield reached 81.5% when milling frequency increased up to 6 [7].

2. The study of determining the suitable frequency of milling of durum wheat

The grains of the above treatment were milled 6 times with a QUADRUMAT JUNIOR mill and weighed a flour of 0.3 mm silk sieve by separating them from the pellets and sludge, and further milling to measure the number of suitable mills.

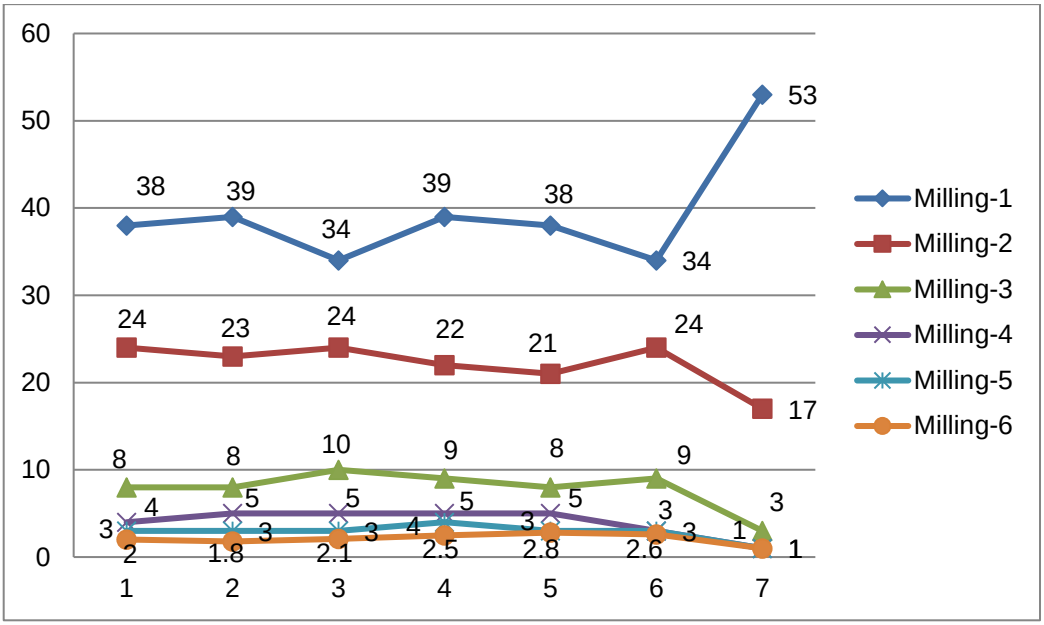

Figure 2. Impact of number of milling in yield of flour, %

Durum wheat flour yield percentages were 34-39% on the 1st mill, 21-24% on the 2nd mill, 8-10% on the 3rd mill, 4-5% on the 4th mill, 3-4% on the 5th mill. 1.8-2.8% flour on 6th mill. For the first 3 mills, the yield of good quality flour is gradually increased. In case of bread wheat, a yield precentages were 53% during 1st milling, 17% at 2nd milling, and 3% at 3rd milling. Durum wheat flour yield increased by milling more than five times comparing to bread wheat.

Yield of bread and durum wheat, %

Number of milling	Sondor			Khar Suvd				
	Moistened and Rested for 20.5h	Moistened and Rested for 24.5h	Moistened and Rested for 28.5h	Moistened and Rested for 20.5h	Moistened and Rested for 24.5h	Moistened and Rested for 28.5h	Average $MRE_{0,5}$ 2,40	Repetition-1 /24.0/
Miilling-1	38	39	34	39	38	34	37.0*	53

Milling -2	62	62	58	61	59	58	60.0*	70
Milling -3	70	70	68	70	67	67	68.7*	73
Milling -4	74	75	73	75	72	72	73.5*	74
Milling -5	77	78	76	79	75	75	76.7*	75
Milling -6	79	79.8	78.1	81.5	77.8	77.6	79.0	76
Total yield of flour, %	79	79.8	78.1	81.5	77.8	77.6	37.0	76

Sondor variety showed highest yield in treatment 2 with 79.8% flour yield and Khar Suvd had 81.5% flour yield in treatment with 20.5-hour rest. Comparing to bread wheat variety Darkhan 144, durum wheat's flour yield increased by 3.8-5.0%.

3. Study to determine the amount of durum wheat supplement n bread wheat bread

Comparing to control group bread, the volume increased by 80 cm where the durum wheat added by 1,2,3,4 % in bread wheat class BG-085, also bread has the most volume when 3% of Sondor variety of durum wheat was added./figure 3/

The flour of the soft wheat class BG-085 increased by 10-80 cm in comparison with the volume of the control grain when the flour of various varieties of solid wheat was added by 1,2,3,4%, and the maximum increase of the flour of Sondor varieties by 3% volume

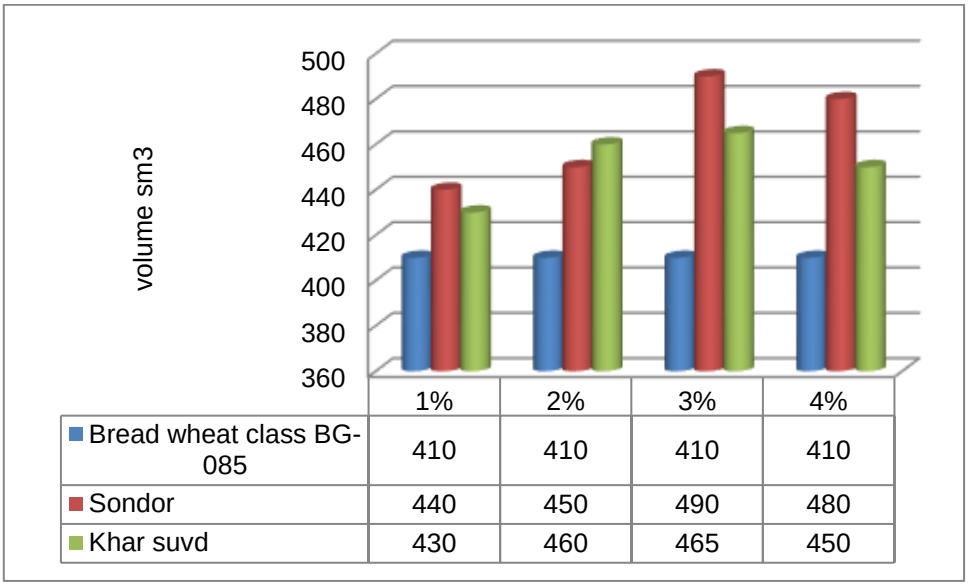

Figure 3. Bread with volume of 1, 2, 3, 4% durum wheat

It has been found that it is best to add 3% durum wheat flour because the gluten of solid durum wheat is low in elongation and the volume, appearance and thinning of the bread are reduced when added in large quantities to the bread wheat flour.

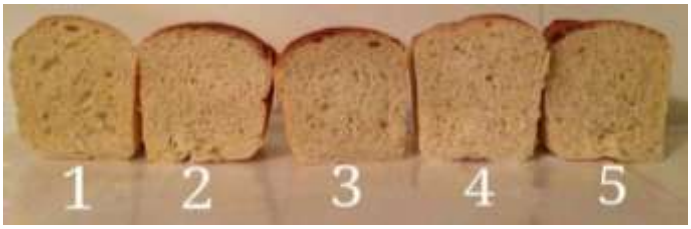

Figure 4. Bread with 1-4% supplement

1. Control
2. With 1% supplement of Sondor durum wheat flour
3. With 2% supplement of Sondor durum wheat flour
4. With 3% supplement of Sondor durum wheat flour
5. With 4% supplement of Sondor durum wheat flour

Bread surgace with 2, 3, 4, 5% supplement of durum wheat flour was flat and smooth thinning / figure 4/.

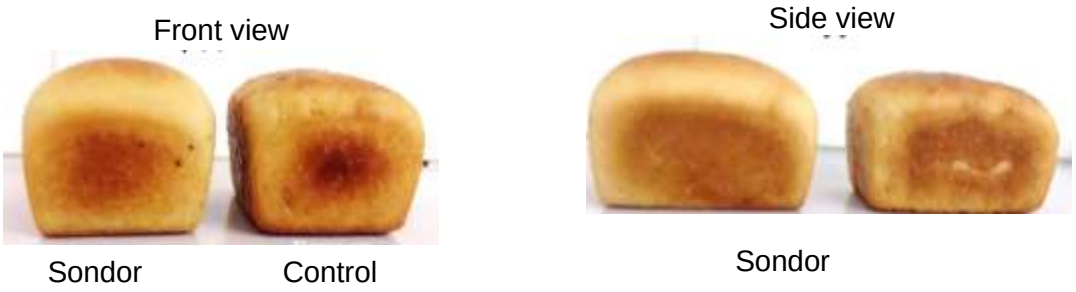

Figure 5. Bread with 3% supplement of durum wheat flour

Discussion

By sowing durum wheat in Mongolia, we can expect a yield of 16.7- 20.7c / ha with more than 30% gluten. According to the Institute of Plant and Agriculture's basic tests, Khar Suvd variety and Sondor have more yield which is resistant to tilt, spill, drought, drought, dustiness and severe black spot disease than Pletcher variety by 4.1 c/ha and 1.7 c/ha respectively.

Seeds of durum wheat have a high hardness of fiber, so due to sow it in continental climate condition like our country, it is necessary to study in detail the technology of sowing, in particular the seed norms and depth.

Conclusions

1. Depending on the durum wheat varieties and seed moisture,the flour yield can reach 77.6-81.5% when to mill the grain rested for 20.5-24.5 hours and reached 17.5% of moisture.
2. The actual yield of flour is increased when durum wheat is milled up to 5 times. The 5 and 6 time have no real differences.
3. With the proper regime of resting and milling of durum wheat, the yield of flour is 3.8-5.0% higher than that of bread wheat.
4. By adding durum wheat in amount of 3% of total bread wheat, is greatly improving bread baking properties

Acknowledgement

Authors would like to thank academic council of Institute of Plant and Agriculture in Darkhan-Uul province, the "Creating the new variety that adaptable for any weather condition"

scientific project team members and Darkhan MUST's food chemistry and technology laboratory members.

References

1. https://www.healthline.com/nutrition/semolina
2. https://healthyeating.sfgate.com/whole-wheat-vs-durum-wheat-vs-stone-ground-4024.html
3. Lattimer JM, Haub MD. Effects of dietary fiber and its components on metabolic health. Nutrients. 2010 Dec;2(12):1266-89. doi: 10.3390/nu2121266. Epub 2010 Dec 15.
4. https://www.chopen-sa.com/
5. Swin Kuz. BMIN, Wheat Conditioning meeting// 2016
6. Batsukh.V, Myagmarsuren.Ya, Experience methodology. Darkhan 2008
7. Satake,R.S (1990), Debranning process is new approach to wheat milling. World Grain