



Bread Waste

It's not WASTE until it's WASTED !



23th February, 2017
Ankara, Turkey



Global production of bread: 125 million tonnes/ year (2011)

- We can separate the bread waste into two
 - Waste during the process
 - Waste after production
- The bakery industry is the second largest waste producers in the cereal processing industry, with the 3 to 5%
- Every day 101 million (250grams/bread) bread is produced, 95 million is consumed and about 6% is thrown away in Turkey.

Turkey

Waste Bread: 2.1 billion pcs/ year
Financial Losses: 545 million \$/ year



Ülkemizde bir yılda israf edilen ekmekle
500 okul yapılabilir



Bread Waste in Turkey

- **Bread production;**
 - 25.295 tons per day,
 - 9.2 million tons per year,
 - when calculated according to 250 gram standard bread this makes 101 million loaves of bread daily, and 37 billion yearly.
- **Bread consumption;**
 - 23.809 tons per day,
 - 8.7 million tons per year,
 - when calculated according to 250 gram standard bread this makes 95 million loaves of bread daily, 35 billion yearly.
- **Waste of bread;**
 - 1.486 tons per day,
 - 542 thousand tons per year,
 - when calculated according to 250 gram standard bread this makes **6 million** loaves of bread daily, and **2,1 billion** yearly.
 - **The rate of waste;** 5, 9 % of the total bread production is wasted.
 - **The total of 6 million loaves of bread wasted in one day is wasted according to the following rates;**
 - **3 million** are wasted in bakeries (**51,4 %**),
 - **2,3 million** at homes (**37,9 %**),
 - **0,6 million** in establishments; personnel and student cafeterias, restaurants and hotels (**10,7 %**)



The Campaign of “Preventing Bread Waste” started on 17 jan 2013

- “Campaign of Preventing Bread Waste”
 - To create social public sensitivity towards waste in the society,
 - ***To prevent waste in the production and consumption stages,***
 - ***To provide that bread is bought as much as needed and is preserved properly,***
 - To inform the society on different ways of using stale bread,
 - To contribute to the economy of the country by preventing waste,
 - To call attention to the fact that the bread used to feed animals is also waste,
 - To emphasize on mainly the waste of bread and waste in general.



Bread Wastage

- We think bread wastage is one of the biggest problems in Turkey due to the amounts of traditional bread that are produced daily. In most of the cases, traditional bread has a shelf life with hours. We support the initiative of the government to cut down the wastage.
- Particularly most of the bread is being wasted in the traditional and unpacked bread. We are in a different space due to the waste of packed bread is much, much lower.
- Why the packed bread waste is lower ?
 - Due to the quality of the ingredients, hygiene and safety of the processes and packaging conditions, the shelflife is longer and bread wastage is lower in packed bread.
 - 10.943 tones of frozen bread had been produced in 2015. There is no research about the wastage of frozen bread. But it is possible to say that the frozen bread has the minimum turnbacks and wastage due to its storage conditions. The consumers can defreeze the breads how much they want to eat and it can avoid the bread wastage.



Who we are...



1

First packaged bread company in Turkey

2

Identified with hygienic packaged bread during 25 years

3

Market leader with 62% market share

4

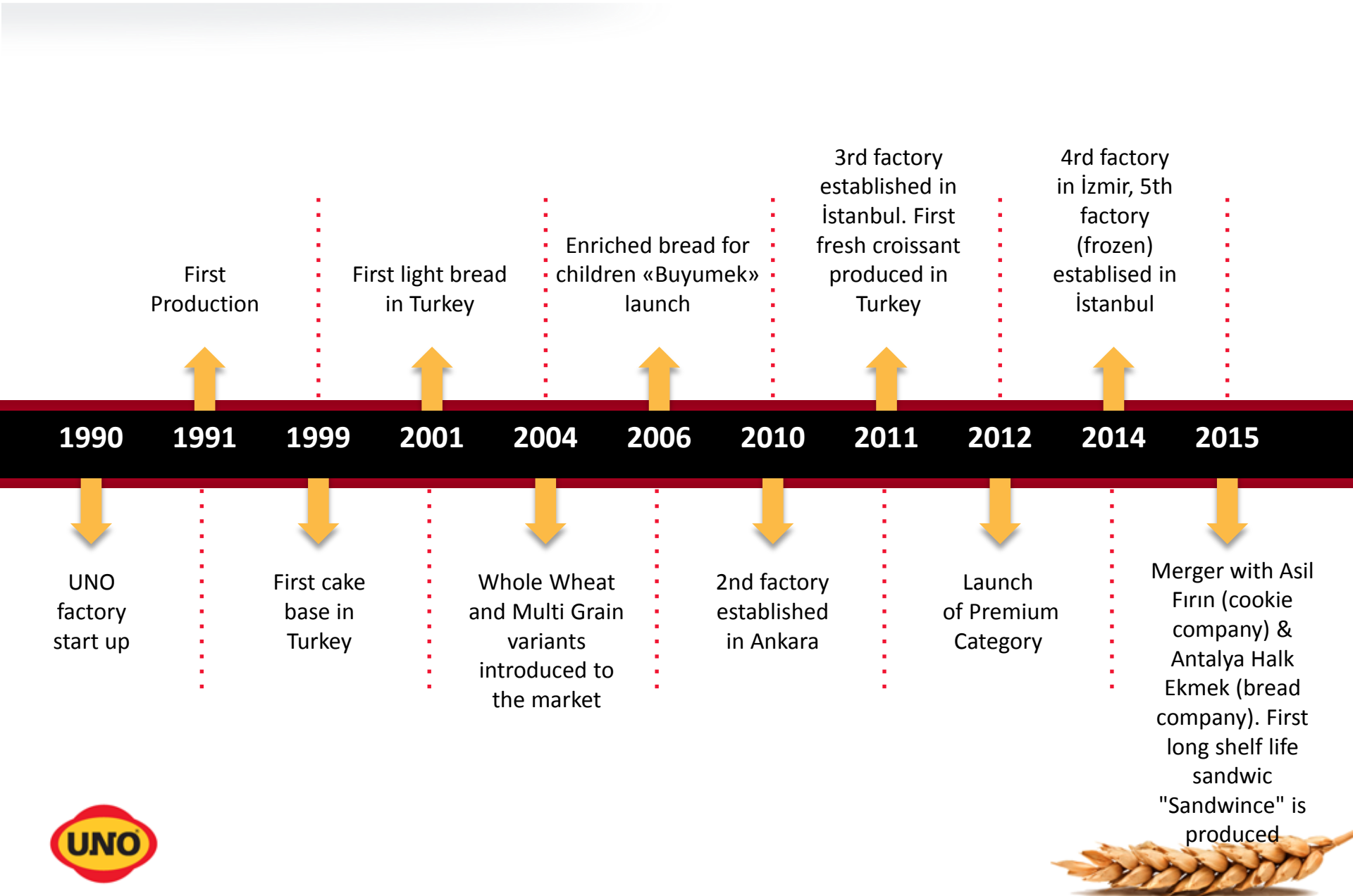
Available in 783.562 km² - all over the Turkey

5

Serving fresh products to 80 million people with high quality



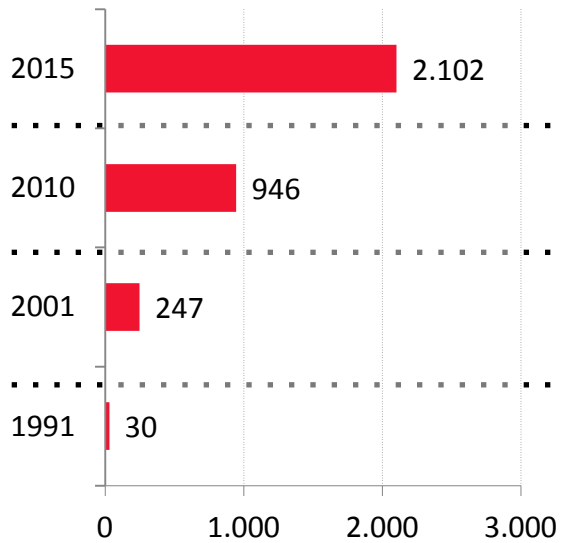
Premium category launch



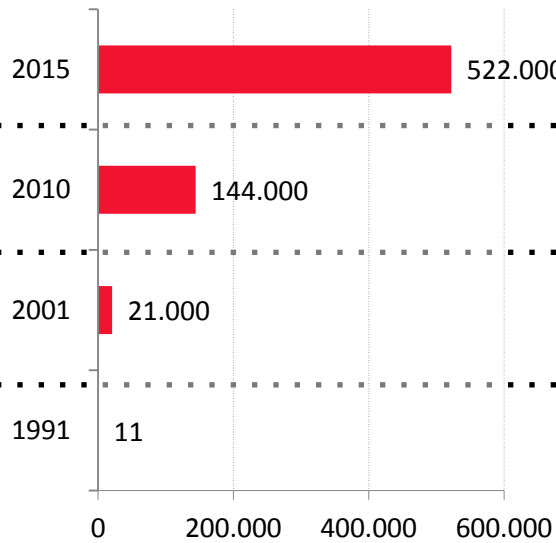
COMPANY BY NUMBERS



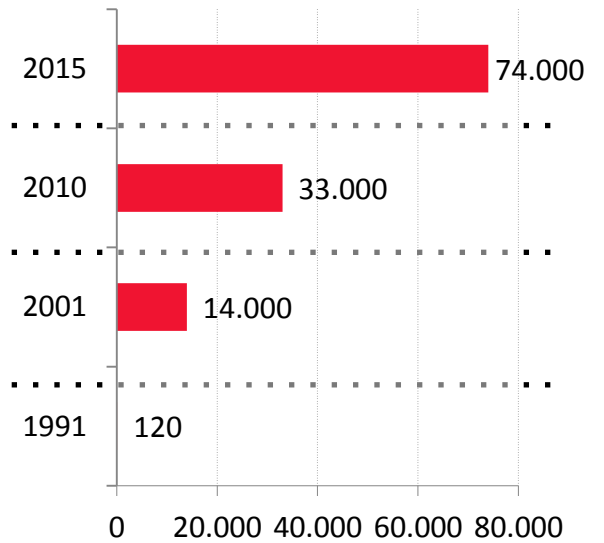
of Employees



Sales Value ('000 TL)



Sales Volume (TON)



FACTORIES – 7 Factories



DISTRIBUTION NETWORK

**81 cities,
73 distribution
centers**

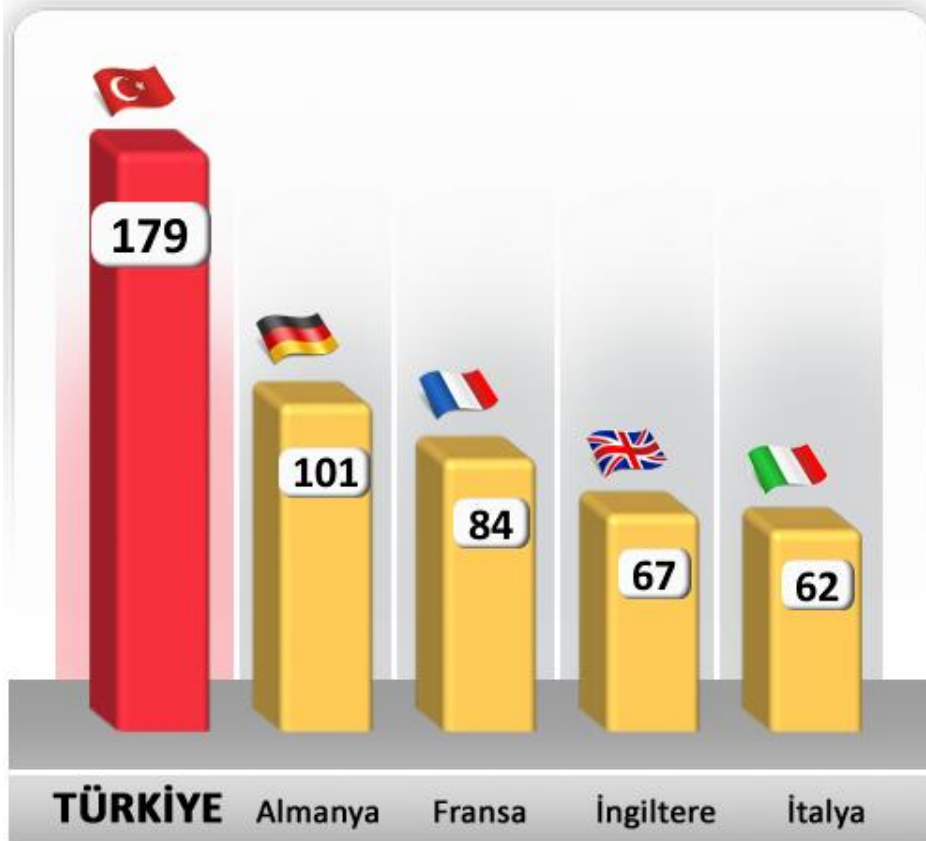
**585 trucks
4,2 million delivery
in a year**

**670 sales &
distribution
employees**



Total Bakery Market in Turkey

Bakery Consumption per capita
(kg/year)



Total market in Turkey:
39.000 M TL



2% is
packaged
bread

UNO is the leader with %72 Market Share



TUBITAK TEYDEB – 3140035

**Bread Formulation and Process Development For
Recycling of Return Bread
01.07.2014-31.08.2015**

UNMAŞ UNLU MAMÜLLER SANAYİ VE TİCARET A.Ş.





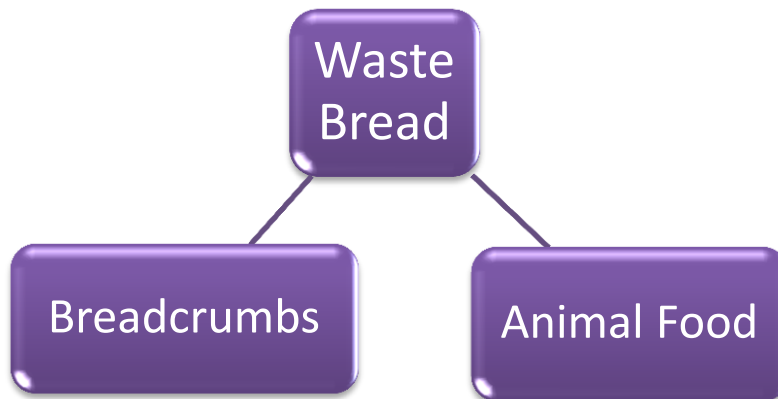
Reasons For Starting The Project

- Bread is perishable than the raw grain and its degradation is almost always biological.

Globaly:

Bakery industry waste is 3,5% (4,37 million tonnes)

- Most of the bread wastage are mainly result from excessive fermentantion, over baking etc. which are caused unwanted shape and volume. In addition, many consumers evaluate softness of the bakery products as freshness, so the amount of waste bread is increasing indirectly.



An important part of bread wastage is not suitable for rework because of mold contamination.





Aim of Project

TMO

- 6 million pieces of daily bread is wasted in our country everyday. Its monetary value is 2.1 billion TL/year
- In Turkey 3% produced bread are not sold, 0,7% of produced bread return back as return and 2.2% of them is trashed or used as animal food.

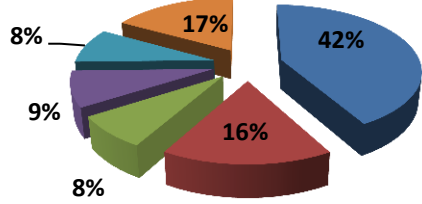


Main Reason
Development of formulation and process for dark coloured waste bread to be regained into production.



Studies Within The Project Period

Gross Production %



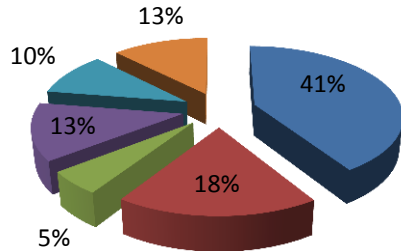
- TOST
- KEPEKLİ
- ÇAVDARLI
- LIGHT
- TAM BUĞDAY
- TAHILLI



% 58 is dark colored bread

The average wastage ratio of sliced bread production is **1.2%** in our company.

Waste %



- TOST
- KEPEKLİ
- ÇAVDARLI
- LIGHT
- TAM BUĞDAY
- TAHILLI

The annual production of sliced bread is 14400 tons, Total waste during production is 172.8 tons.(1.2%) 59% of 172.8 tons of waste is dark colored bread. 102 tons of waste/year could be recycled in the procution





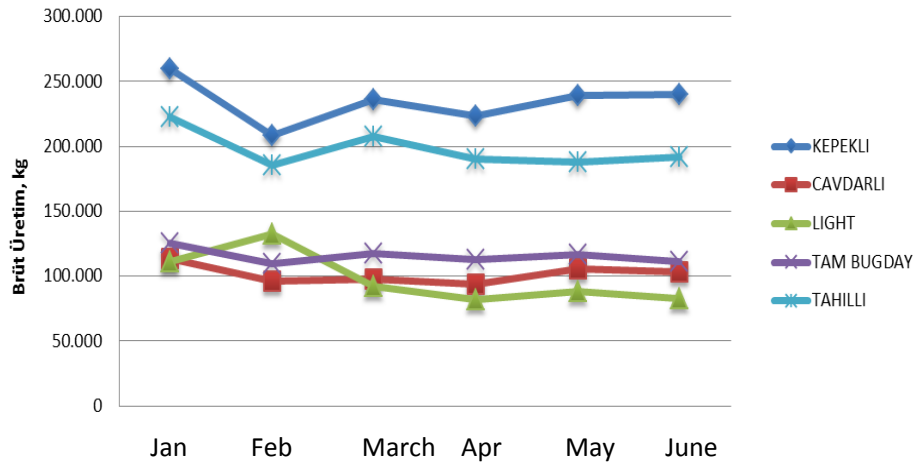
Studies Within The Project Period

Determination of Research and Analysis Details

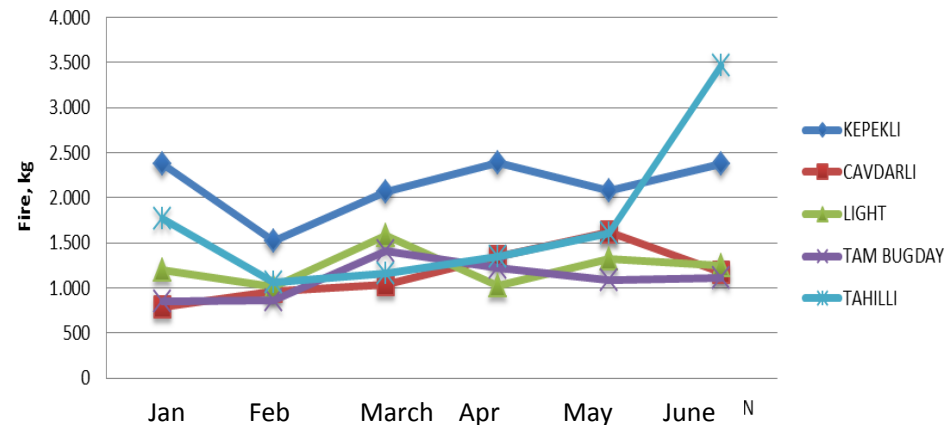
Updating of Waste Amounts

Within the project plan, trend analysis was performed for the daily waste generation during 6 months in sliced bread production line, which our dark bread production is realized. The distribution of the product diversification to actual amount of waste is set out in Table.

Gross production kg/month



Waste kg/month





Studies Within The Project Period

Waste bread evaluation methods;

- Aroma compounds
- Seasoning
- Ethanole
- Protein
- Lactic acid, acetic acid production
- Subsution of starch
- ***Sourdough***
- Methane
- Sugar syrup
- Yeast feed





Studies Within The Project Period

Investigation of Liquid Sourdough Production Methods

Natural Fermentation Method: When dough left 1-2 days at room conditions , fermentation occurs due to the flours natural microfloras and doughs pH increase. LAB (*Lactobacillus spp.*, *Pediococcus spp.*) becomes dominant during fermentation.

Mature Sourdough Addition Method: In this method, metabolically active sourdough is used in sourdough bread production.

Starter culture usage: A pure culture of LAB or LAB/yeast mixture used to realize fermentation.



Return Bread Sourdough Production Trials in Pilot Scale

Pilot Scale Return Bread Sourdough Production Flowchart



Sourdough resting (proofing) Time	24 h	48 h
pH	5,17±0,01	4,77±0,02
Humidity (%)	68,5±0,02	68,4±0,09
Acidity (%)	12,4±0,15	13,9±0,17



Studies Within The Project Period

Development of Recycling Process of Return Bread in Lab. Scale

Liquid Sourdough Formulation Studies From Different Waste Bread Types

EXPERIMENT	SLURRY	BRAN (%)	RYE (%)	LIGTH (%)	WHOLE WHEAT (%)	MULTI GRAIN (%)
1	Bran	100				
2	Rye		100			
3	Ligth			100		
4	Whole wheat				100	
5	Multi grain					100
6	Mix 1	29	15,1	19,4	16,3	33
7	Mix2	23	15	15	13	20,2

Determination of Quality Characteristics and Optimization

Moisture, pH, acidity, reducing sugar, total aerobic mesophilic bakteri, total mold and lactic acid bakteri analysis were realized in return bread sourdough formulations.

Reducing sugar, microbiological analysis were performed in **Yıldız Teknik Üniversitesi**.

EXPERIMENTAL DESIGN	Nem	pH (Ferm. Öncesi)	pH (Ferm. Sonr)	Asitlik	İndirgen şeker (g/100g)	Toplam Aerob Mezofilik Bakteri (log kob/g)	Toplam Maya (log kob/g)	Laktik Asit Bakterisi (log kob/g)	
KEPEKLİ	71,0	5,55	5,39	0,47	2,16	7,85	6,3	6,62	
ÇAVDARLI	68,8	5,11	5,11	0,48	5,13	7,04	6,26	6,34	
LIGTH	71,0	5,23	5,17	0,52	4,32	7,34	6,36	5,95	
TAM BUĞDAY	69,8	5,12	5,04	0,57	3,35	6,54	5,76	6,80	
TAHILLI	70,7	5,41	5,29	0,52	2,43	6,79	6,23	5,95	
KARIŞIM 1	Mix 1,	70,4	5,32	5,26	0,48	2,54	6,93	6,08	5,94
KARIŞIM 2	Mix 2	69,9	5,31	5,27	0,52	2,02	6,04	6,26	4,9

The lowest acid production was obtained by whole wheat return bread sourdough.

- It has been found to be more intense aroma in rye sourdough bread.





Studies Within The Project Period

RESULTS OF LAB. SCALE SOURDOUGH BREAD PRODUCTION

- 25% usage of dark colour sourdough negatively effect physical, chemical, textural, sensorial properties of UNO Multigrain Bread.
- 15% usage of dark colour sourdough is decided to use in multigrain bread to obtain standart bread quality.

Optimized Dark Colour Sourdough Design for Pilot Scale

type of waste bread	Mix 1	Mix 2	optimum mix
bran	29,0%	23%	29,5%
rye	15,1%	15%	22,4%
ligh	19,4%	15%	14,0%
whole wheat	16,3%	13%	19,5%
multi grain	20,2%	33%	14,6%





Studies Within The Project Period

Realization of Physical, Chemical, Textural, Microbiological and Sensory Analysis of Sourdough Breads

Physical Analysis Results of Multigrain Bread Produced in Pilot Scale

	control	Multigrain Bread produced with 24 hour proofed sourdough liquid	Multigrain Bread produced with 48 hour proofed sourdough liquid
weight- 460±14 g	451,7±1,8	458,3±1,1	461,0±1,2
length - 20,5±0,5 cm	21,4±0,17	21,0±0,05	21,1±0,45
width - 9,5±0,5 cm	9,0±0,08	9,2±0,17	9,4±0,16
height - 11,5±1 cm	11,0±0,12	11,0±0,21	10,7±0,05
volume,ml	2748±6,24	2753±4,71	2683±2,36
Specific volume,ml/g	6,1±0,12	6,01±0,1	5,9±0,08





Studies Within The Project Period

Physical, Chemical, Textural, Microbiological And Sensory Analysis Result of Sourdough Bread

Chemical Analysis Results of Multigrain Bread Produced in Pilot Scale

	control	Multigrain Bread produced with 24 hour proofed sourdough liquid	Multigrain Bread produced with 48 hour proofed sourdough liquid
Humidity (%)			
1.day ave.	35,5±0,04	36,5±0,07	36,8±0,04
4.day ave.	35,3±0,07	36,6±0,02	36,9±0,10
7.day ave.	35,5±0,02	36,6±0,01	36,7±0,02
12.day ave.	35,7±0,04	36,8±0,02	36,5±0,02
Ph			
1.day ave.	5,48±0,02	5,41±0,01	5,33±0,02
4.day ave.	5,44±0,01	5,40±0,00	5,31±0,01
7.day ave.	5,44±0,01	5,38±0,01	5,27±0,02
12.day ave.	5,42±0,01	5,37±0,02	5,25±0,02
Aw			
1.day ave.	0,943±0,002	0,935±0,003	0,935±0,002
4.day ave.	0,947±0,002	0,935±0,003	0,935±0,001
7.day ave.	0,939±0,001	0,933±0,001	0,934±0,002
12.day ave.	0,933±0,001	0,936±0,001	0,936±0,002
Acidity			
1.day ave.	7,5±0,02	8,6±0,18	9,5±0,18
4.day ave.	7,4±0,02	8,7±0,15	9,6±0,11
7.day ave.	7,6±0,02	8,7±0,21	9,6±0,15
12.day ave.	7,6±0,02	8,8±0,18	9,5±0,20

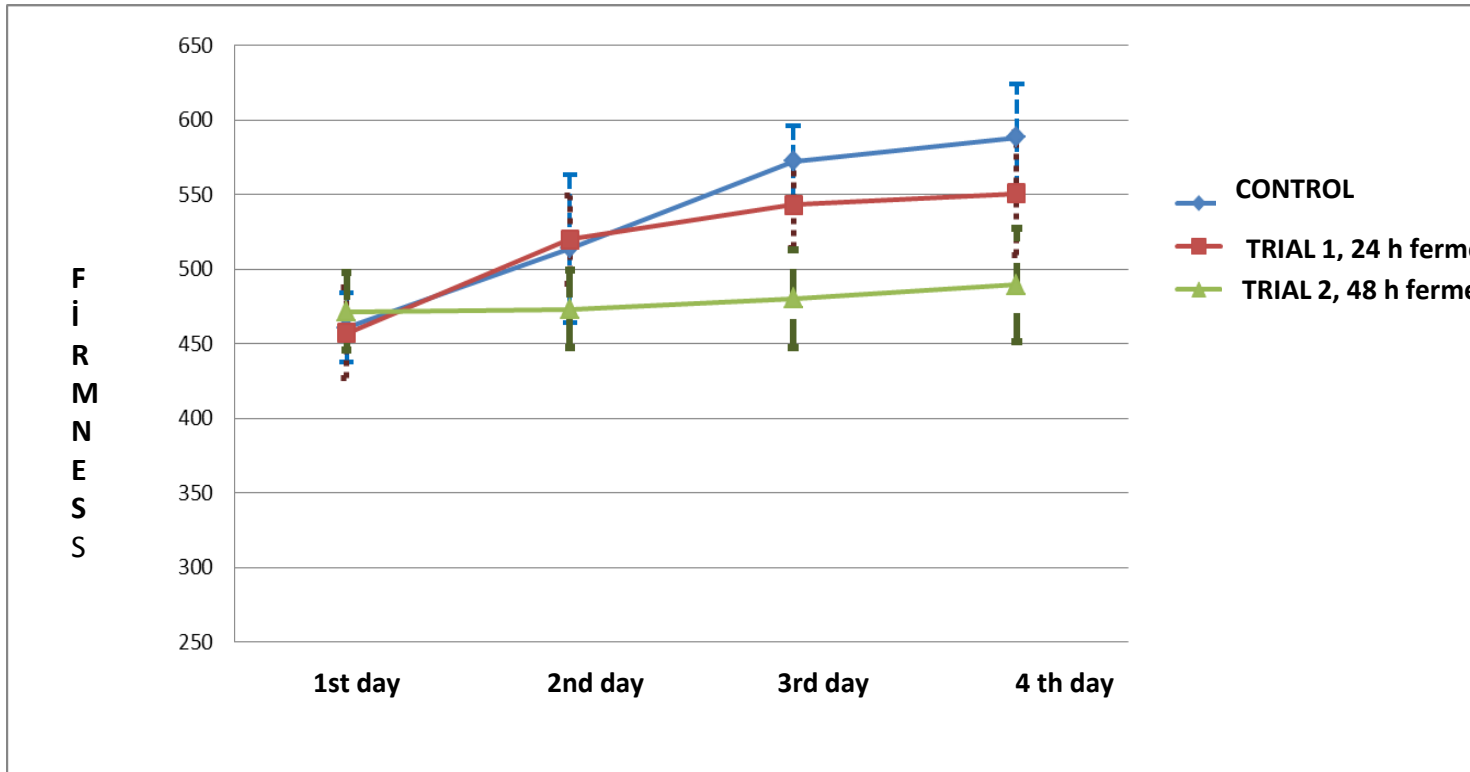




Studies Within The Project Period

Texture Analysis Results of Multigrain Bread Produced in Pilot Scale

Self life	KONTROL	Multigrain Bread produced with 24 hour proofed sourdough liquid	Multigrain Bread produced with 48 hour proofed sourdough liquid
1.day	460,9±23,1	457,2±30,6	471,6±26,0
4.day	513,8±49,4	519,7±29,4	473,2±26,2
7.day	572,2±24,1	543,1±29,4	480,4±32,8
12.day	588,4±35,3	550,5±41,1	489,3±37,8





Studies Within The Project Period

Microbiological Analysis Results of Multigrain Bread Produced in Pilot Scale

self life	KONTROL	Multigrain Bread produced with 24 hour proofed sourdough liquid	Multigrain Bread produced with 48 hour proofed sourdough liquid
mold-Teast (Limit value-1×10^3 kob/g)			
1.day	0	0	0
4.day	0	0	0
7.day	0	0	0
12.day	2000	0	0





Studies Within The Project Period

Sensory Analysis Results of Multigrain Bread Produced in Pilot Scale

Modified bread Score Test Parameter Definitions

The expert panel has identified characteristics of multigrain bread with 15 properties.

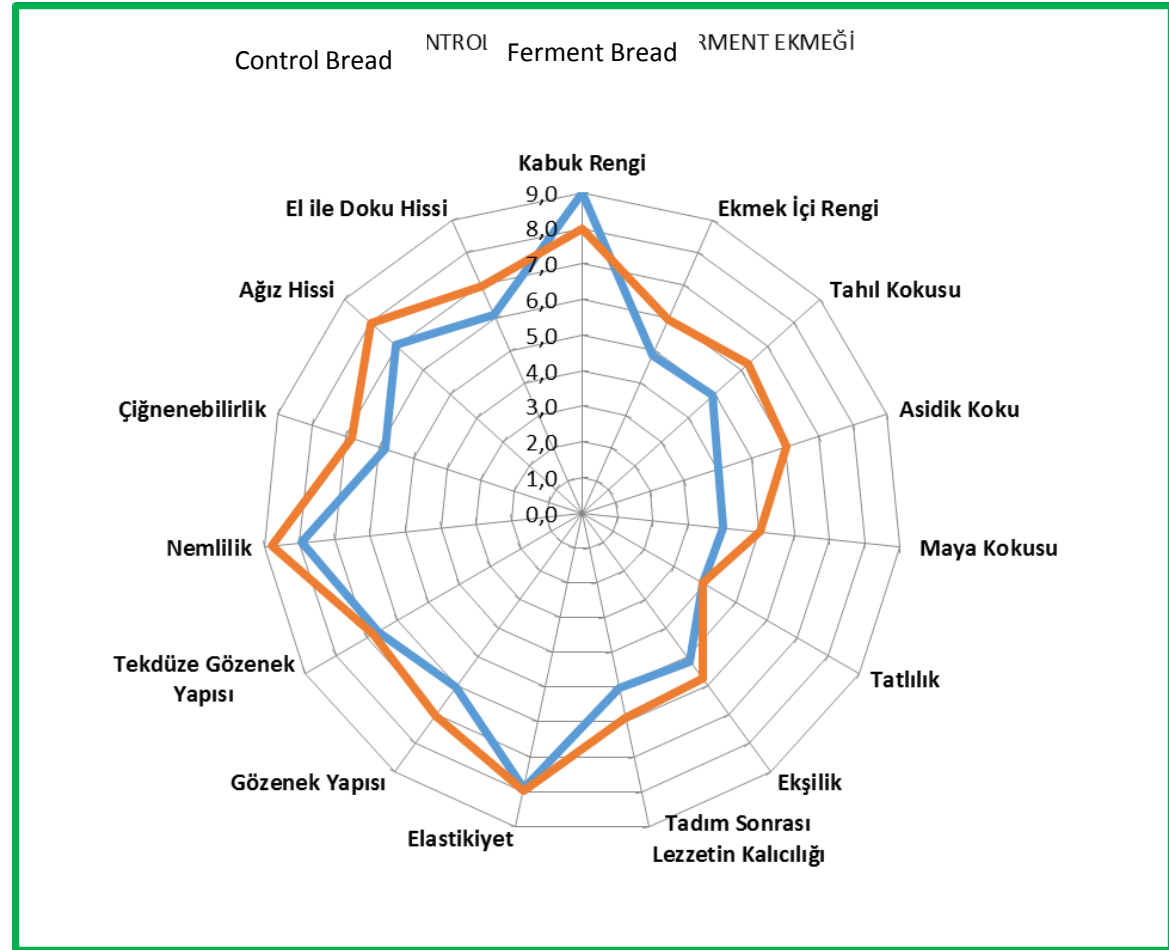
Comparison of 24 h ile 48 h Ferment Dough Quantitative Identifier Analysis (N=16)

N = 16	24h Ferment		48 h Ferment	
Crust color	6,4	b	8,0	a
Crumb color	4,3	b	6,0	a
Grain smell	6,6	a	6,3	a
Acidic smell	6,4	a	6,0	a
Yeast smell	7,3	a	5,0	a
sweetness	4,1	a	3,9	a
sourness	3,5	a	5,8	a
Flavour	4,1	b	5,9	a
Elasticity	7,3	b	8,0	a
Pore structure	6,8	a	7,0	a
Pore distrubution	7,2	a	6,8	a
Humidity	5,7	b	8,8	a
crackable	6,1	a	6,8	a
Mouth feeling	7,5	a	8,0	a
Texture feeling	7,1	a	7,0	a



Graphical Chart of Sensory Properties

- Crust color
- Crumb color
- Grain smell
- Acidic smell
- Yeast smell
- sweetness
- sourness
- Flavour
- Elasticity
- Pore structure
- Pore distribution
- Humidity
- crackable
- Mouth feeling
- Texture feeling



Result, It is decided to prepare the sourdough liquid with the optimum mix of dark color waste breads, and used in Multigrain Bread with the 15%. According to bread scoring tests there is no significant difference between «control multigrain bread» and Multigrain Bread produced with 48 hour proofed sourdough liquid.

With this project every month we are saving 8500 kg of waste bread.





Thank you

