**Lactobacillus/Rye Flour Ferment**

**Fermented Rye as multi talent in the cosmetic scene of nature and biologic-active substances**

**Summary:**
The grain is being fermented in a special patented technology and prepared in such a way that a row of innovative nature biologic-active substances with surprising characteristics is available. Until now the main experiences which have been practically collected with a special prepared rye flour as starting substance. Lesions go back significantly, skin humidity increases, skin roughness becomes effectively less. Head dandruff and itching are reduced distinctly. The efficiency against staphylococcus epidermis and propionic bacterium acne was proved.

In consideration of
- different starting substances like germ or flour
- different sorts of flour
fermentation products with specific characteristics can be produced according to customer’s request. By the following centrifugation and several filtration processes you can receive easy handling fractions from water-thin to middle-viscose defined consistence for all cosmetic product groups. Formulations based on fermented rye flour for Skin Care, Hair Care, Body Care and Decorative areas could be recalled.

The clear last filtrate (*Lactobacillus/Rye Flour Ferment Filtrate*) can be also offered as liposomal encapsulated. The „middle“ viscose fraction could be bound into a matrix for example Silica so that a flow-capable powder appears.

1. **History**

Fermentation products from grain especially from rye have been used by people since old times – for example for healthy and unadulterated nutrition. 6000 years ago the leaven was discovered as a result of spontaneous fermentation. Since that time it was cared and cultivated.

2. **Starting substance rye**

**Table 1** shows distribution of water, proteins, minerals, starch, vitamins, ballast substances (cellulose) and fat in the whole corn.

![Diagram of corn description](attachment:diagram.png)

Corn description from outer to inside:

The grain corn consists of *mother tissue* and *daughter tissue*. The mother tissue is the visible first coat of the corn and it surrounds the whole corn as well as the germ; it consists of *fruit-coat and seed-coat*.

The *daughter tissue* begins with the *seed skin*, it is the second part of the *seed-coat*. Then the *flour body* and the *germ* follow.
Vitamins: There are the following vitamins of B-group: B1, B2, B6 as well as biotin, folic acid and pantothenic acid. They are available in different shares in the separate coats. Pantothenic acid can be found in edge coats. Vitamin C is almost completely absent.

The enzymes are mainly presented in the aileron coat. The amino acids are distributed in the entire corn.

### Table 1: Rye flour type 1150

<table>
<thead>
<tr>
<th></th>
<th>Weight %</th>
<th>Protein %</th>
<th>Minerals %</th>
<th>Fat %</th>
<th>Vitamins</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fruit-coat</td>
<td>5 – 6</td>
<td>7.5 % = 0.4 % Total</td>
<td>5.5 % = 0.3 % Total</td>
<td></td>
<td>Pantothenic acid</td>
</tr>
<tr>
<td>Seed-coat</td>
<td>2.5</td>
<td>14.23 % = 0.45 % Total</td>
<td>8.24 % = 0.4 % Total</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Aileron coat</td>
<td>7 – 9</td>
<td>29.38 % = 2.7 % Total</td>
<td>5.11 % = 0.6 % Total</td>
<td>7.12 % = 0.75 % Total</td>
<td></td>
</tr>
<tr>
<td>Flour body / Corn</td>
<td>80-85</td>
<td>1.6-7.9 % = 10 % Total</td>
<td>2.2-1.6 % = 1.55 % Total</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Flour body / Corn/ Aileron coat</td>
<td>87 – 94</td>
<td>26 = 0.4 % Total</td>
<td>4.5 = 0.11 % Total</td>
<td>10 % = 0.25 % Total</td>
<td>A E D F B1 B6</td>
</tr>
</tbody>
</table>

3. Production process

The initial flour (Rye flour specially prepared for cosmetic production that is reproducible independent from harvest) is being fermented with micro organisms of Lactobacillaceae family by special facility technology until no more metabolism activities are to be found out (obligate hetero-fermentative metabolism). The process will be monitored by the pH-value. The process is completed after reaching of pH-3.2 afterwards the assembly is being pasteurized.

Ballast substances (cellulose)/starch → Fermentation → Hexoses / Pentoses /Lactate / Ethanol / Acetate / CO₂ / Rest-sugar / Rest-starch (insoluble „Rubble grains“) / H₂O

Protein → part-hydrolyze → amino acids

Minerals → unchanged

Vitamins → B₁ to B₆ / Folic acid / Pantothenic acid / Niacin

Fat → Hydrolyze?

A light brown colored „Gel“ will be gained with particles of hard materials that shows a typical smell of bread.

Because raw materials with particles could be only limited inserted in cosmetic formulations, but we would like to keep all valuable components, the separation is being carried out in a very expensive technology. By centrifugation and filtration in several steps a fluid with rest-starch and a clear filtrate will be gained i.e. the serum (Lactobacillus/Rye Flour Ferment Filtrate).
4. Specifications

All three product versions - woresan rye gel / woresan rye fluid / woresan rye serum have a pH-value of 3.2 – 3.3 and a typical smell of bread. The viscosities of gels lay at approx. 4,000 mPas and viscosities of fluids at approx. 7,000 mPas. The serum is clear and very easy opalized. The raw materials are standardized and pre-conserved with 0.6% sorbic acid. Non-conserved products are also available on request, and they can be mixed with own domestic means after opening the tanks.

5. Benefits

During the first tests the gel as pure mask was applied to the face, 5 to 10 minutes later a film was formed, after washing up with lukewarm water the skin had the soft and smooth feeling. After many applications unclean skin disappears.

The unclean skin is a typical phenomena of puberty. A typical form of that skin is the acne vulgaris. It is a hormone dependent, self limited inflammable dermatosis. Its prime lesion is the blackhead and its appearance picture is characterized through natural process of inflammatory changes on the blackhead, its final condition is the scarred healing.

Dermatological researches showed an obvious improvement of skin condition of impure skin after application of woresan Rye Gel Mask. Well-found scientific knowledge confirms this positive development, caused through the milk acid and the pH-value of the mask (3.2-3.5).

![Reducing the lesions of test persons 1-5 up to the factor of 2,5](image1)

![Anti microbial efficiency of „woresan rye serum“ 3 %](image2)

The skin surface consists of corneozytes that reject each other. The relief of the skin surface is furrowed more or less heavy. The micro relief depends on different factors, for example on the age of person and on skin area. Additionally it also shows seasonable dependence.
Dermatological researches showed after 7-days application of woresan Rye Gel Mask a light reducing of roughness, caused by protein and lactate content of the mask.

The skin as the most extreme delimitation of the body is in contact with the environment and additionally it fulfills a number of essential functions for the organism. Besides protection of the organism against environmental influences the skin gains high importance with respect to mentally well feeling of the person. An improvement of skin characteristics can be reached through skin moistening with moisture giving externals. The skin moistening causes softer feeling as well as smoothing of skin surface by hydration of the stratum corneum.

Dermatological researches showed a light increase of skin moistening after 7-days application of woresan Rye Gel Mask. This effect is caused by proteins and lactate content of the mask as well.

Internal consumer tests show that the serum, diluted with water in proportion 1:3 and then applied to the head skin, reduces dandruff problems visibly. Inflammable parties of greater head skin zones could be improved significantly.

The first Gel test by using against dandruff plait shows light improvement.

6. Effective mechanism

Rest sugar / Hexoses / Pentoses are responsible for increase of skin moisture. In contrast to barley, oats and wheat, the rye (the whole corn) contains the highest total share of monosaccharides (1). These monosaccharides can be found again in all fractions (gel, fluid and serum).

The rest starch is available in the fractions of gel and fluid, their share determines the consistence of the fractions. As different cultivation areas and different harvests make influence on the flour starch content and consequently on the viscosity of the final product, the flour has been already mixed with variable amount of amylase in the mill, in order to reach the reproducible viscosity of the gel.

The lactate content lies at approx. 1% and it is responsible for the pH-value up to 3.2 –3.3. Here the peeling effect appears, the hyper-porosity of the skin reduces, as well as over-hornification of the epidermis, freckles and pigments toned down.

The (partly) hydrolyze of the proteins and their composition makes interesting all fractions not only for the skin but also specially for the hair. The amino acid analyze shows a conspicuous higher share of sour amino acids in contrast to amino acid composition of collagen and keratin. The isoelectric point of the proteins respectively of the peptides lies in the weak sore area. First of all the high content of glutamate and aspartic acid plays here significant role. Formulations of woresan rye gel, fluid or serum
in Skin and Hair Care Area give to skin and hair smoothness by film forming characteristics. Skin and
hair are protected against drying.

![Graph showing distribution of amino acids in Woresan Rye Germ Serum and Woresan Rye Gel]

Table 2  Distribution of amino acids in „woresan rye germ serum“ and „woresan rye gel“

Between minerals calcium, potassium, magnesium, copper and the microelement zinc are of
particular importance for skin and hair. All these minerals can be found again in the fermented rye
and in such a way they can provide the skin optimum. First of all vitamins of B-group, - here especially $B_1$, $B_2$, $B_6$ and panthotenic acid were preserved by the fermentation. Besides them vitamin E, nicotinic acid amides and folic acid are also detectable. These vitamins take care for accelerating the formation of epithelium, for better blood-supply and they also act in the organism as acid-reducing ferment. They show good effect against acne and seborrhea. The anti-oxidative effect of tocopherols (vitamin-E) should not be disregarded as well. All described content materials are only a fraction of that, what the fermentation product contains in fact. The estimations assume that more than 200 substances are available. The proved effects could be explained with the fact that it concerns here not an usual water and fat soluble extract, but all content materials together can develop their complete synergistic effect.

7. Outlook

The composition of the fermented rye products let suppose further effects. Proved inflammation
retarding characteristics and the immune system stimulating sugar, here first of all oligosaccharides
($\beta$-glucan) could be of importance for the use in Anti-Aging, Anti-Wrinkle and Sun Care products. The
necessary studies for that purpose are being in preparation.

For reinforcement of efficiency it succeeded in encapsulating the serum liposomal. The fluid can be
bound in a silica-matrix, you can produce very stable flow-capable powdery biologic active substance.
A mixture of fermented flour and germ in optional proportions opens the possibility to emphasize
special benefits. Bringing respective fractions into cosmetic formulations like W/O, O/W emulsions, Gels and WAS
makes no problems. Formulations could be presented at your request.

Literature: (1) Souci, Fachmann, Kraut: Food Composition and Nutrition Tables; 5th revised and
completed edition

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