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## Superfoods? Overview of Moringa and Matcha

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*There are probably lots of reasons why people no longer know what optimum nutrition is: One of these is that scientists are constantly changing the nutrition rules. Another is the increasing appearance of often bizarre diets promising optimum results and claiming to have the right remedy for every ill. No wonder a third of people in Germany are avid consumers of food supplements such as vitamin preparations, plant extracts or capsules with omega 3 fatty acids. The market for these supplements in Europe is six billion euros. The annual growth rate of three to five per cent is further proof of how lucrative this business is.*

Demographic developments, the related increase in health awareness and the considerable purchasing power among the older generation are certainly reasons for the high demand. The regulatory framework for marketing communications is very tight. The Health Claims Regulation (EC) No. 1924/2006 and the German Food Supplements Ordinance (NemV) establish clear rules on this. Statements on a product's mode of action can only be made using the authorised claims (see EU Register on Nutrition and Health Claims), which must be supported by scientific evidence. The German Food Supplements Ordinance defines food supplements as "food which 1.) is intended to supplement the normal diet,

2.) is a concentrated source of nutrients or other substances with nutritional or physiological effect on their own or in combined form and 3.) is marketed in dose form (...)". Nutrients in the context of this ordinance are vitamins and minerals including trace elements. The German Food Supplements Ordinance also makes a statement concerning the packaging and publicity of a product: "The labelling, presentation and advertising of a food supplement must not state or imply that a balanced or varied diet cannot provide appropriate quantities of nutrients in general."

Additionally, a marketer (producer or importer) of a food supplement must submit a notification to the German Federal Office of Consumer Protection and Food Safety (BVL), at the latest when first placing it on the market, together with a sample of the product la-

bel. This enables the German authorities to keep track of the offer and maintain controls more easily.

One particular sphere of food supplements is that of dried plant parts or plant extracts. Examples of these are tea, herbs and spices. Their positive effect on the human organism has been known and valued for thousands of years. What is "novel" in this respect is the introduction of exotic plants such as moringa and matcha, which have been used in the diet in their countries of origin for decades.

**Moringa oleifera – the tree of life** > Moringa belongs to the family of moringaceae. The name comes from the word for drumstick, which describes the appearance of the pods. Moringa is also known as the ben oil tree, from the oil which is derived from the pod seeds. Virtually all parts of the plant can be used in the diet: leaves, fruit, blossoms, seeds and oil, as well as the powder from the leaves. Because of the long transport routes, western countries place the highest value on moringa in powder or capsule form. These presentation forms are basic requirements for classification as food supplements. The shoots taste like horseradish and the fruit tastes like asparagus. Because of the high concentration of nutrients, moringa is considered to be the supplement with the richest supply of vital substances on the market. It contains 90 important nutrients in sufficient concentrations. Here are some examples:

17 x as much calcium as milk,  
15 x as much potassium as bananas,  
7 x as much vitamin C as oranges,  
7 x as much vitamin B1, B2 as yeast,  
6 x as much polyphenols as red wine,  
4.5 x as much folic acid as beef liver,  
4.5 x as much vitamin E as wheat seedlings,  
4 x as much vitamin A and 2.5 x as much carotene as carrots

Overall, regular intake of moringa can help enhance and protect the immune system. However, these claims are based on traditional use in the



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countries of origin. So far there have been few scientific studies carried out directly on humans. Many of the existing studies draw their findings from animal experiments on rats or mice. One of these studies, which was undertaken by French researchers and published in the *Dakar Med Journal*, found that moringa roots have anti-inflammatory properties and could be helpful in the treatment of acute inflammatory conditions such as bronchitis and rheumatoid arthritis.

In the study the researchers administered either distilled water (the control group) or 10 mg/kg indomethacin (an anti-inflammatory drug) or a root extract of *moringa oleifera* (750 mg/kg or 1000 mg/kg) to a group of rats. 30 minutes later, a swelling was induced on the rats' paws by means of an injection of carrageenan.

It was shown that 750 mg/kg moringa extract inhibited the development of oedema one, three, and five hours after the injection. Increasing the dosage to 1000 mg/kg did not inhibit oedema development any further after one hour and three hours, but it did increase it after five hours. Indomethacin inhibited oedema development at comparable levels to the 750 mg/kg dose of moringa extract.

The website Examine.com has a very good review of the scientific studies on moringa. The authors are committed to unbiased reporting on health supplements and diet. In their article on scientific research into moringa they cite 140 references, which they arrange into individual topics. Here are some examples of the authors' comments:

- As far as the overall macronutrient and phenolic contents of *moringa oleifera* are concerned, the stem and root portions of the plant appear to have the least bioactives of interest (phenolics, proteins and fatty acids), which supports the use of the **leaf extracts as the medicinal component**. The flowers appear to have a high phenolic content and, as with most seeds, moringa's seeds contain mainly proteins and fatty acids.

- While the plant is a **source of flavonoids**, the main bioactives, which seem to be somewhat unique to this plant, include the isothiocyanate class of molecules (structurally similar to sulphoraphane), the carbamates and their glycosides. Niazirine and RBITC seem to be important components. This plant appears to have a small paracetamol content – interestingly, as glycosides.
- There appear to be **anti-amnaesiatic properties** associated with moringa leaf extracts, although the exact molecule underlying these benefits is not known and the potency is not absolute.
- Moringa may inhibit cholesterol absorption from the intestines, but this does not appear to be involved with the inhibition of fatty acid absorption.
- The limited evidence in humans suggests there may be a **hypolipidaemic effect** of moringa supplementation in diabetics.
- Currently unknown components in the leaves appear to possess fairly respectable **anti-bacterial properties**
- Moringa appears to be a respectable **anti-oxidant *in vitro*** from the point of view of scavenging free radicals, but it fails to outperform vitamin C, and it is less potent than many other medicinal herbs
- The antioxidant effects of the leaf extracts apparently also occur in the kidney, where they may protect against oxidative toxins
- Moringa appears to have **anti-cancer properties *in vitro*** against pancreatic cancer, but this occurs at a relatively high concentration and may not be optimum following oral ingestion of the supplement
- Moringa appears to have quite potent **anti-fertility actions** in pregnant rats, and may be able to induce **abortion**. It is therefore not recommended for pregnant women.

Moringa leaves are also a good source of protein. There are 9 essential amino acids required for human protein synthesis: histidine, isoleu-

cine, leucine, lysine, methionine, phenylalanine, threonine, tryptophan and valine. Moringa provides these in quantities which are more than sufficient compared with the standards for small children stipulated by the World Health Organisation (WHO), the Food and Agriculture Organisation (FAO) and the United Nations Organisation (UNO).

A further use stems from the ability of the seeds to disinfect and purify water. 0.2 g ground moringa seed can turn 1 litre of contaminated water into drinking water. The water-purifying effect of moringa is chiefly due to the coagulating action of certain ingredients in the seeds. The bacteria and suspended particles clump together to form agglomerates, which sink to the bottom or can be filtered out. The ingredients of the seeds also have direct bactericide properties.

**Oral use of moringa powder** > As already mentioned, there have so far been few studies carried out on humans. This means it is only possible to calculate the recommended intake based on animal experiments using aqueous extracts from the leaves. On the basis of these experiments, the optimum dose for humans has been calculated as 29 mg per kilogram body weight. The question arises as to whether this dose is sufficient to achieve a positive result. At the same time it is also known that high doses can have the reverse effect and produce negative results, such as a genotoxic effect on cells.

When using moringa it should be noted that it is a plant which grows naturally and over the course of time is subject to influences from the soil and air as well as from contact with people and animals. This includes microbiological contaminations and combustion products from exhaust emissions in the countries of production. For this reason it is not advisable to buy a moringa product which has come onto the German market without being sterilised.

As a result of their research into the various studies, the authors of Examine.com come to a sobering conclusion:

“This supplement needs to be approached with a measure of scepticism. While there is definitely some good research substantiating the use of moringa, there are also some drawbacks. As the tree is so economical, supplements are cheap and easy to produce. These low overhead costs make it ideal for companies to mass produce moringa and market it based on its nutrient content and antioxidant potential. While these properties are notable, they are not amazing.”

**Matcha – green gold** > Matcha, meaning “ground”, is made from tencha tea, one of the oldest tea sorts in Japan. The tea leaves ripen slowly in shaded plantations. The freshly dried leaves are then slowly ground to a fine, jade-green powder using traditional granite grindstone mills. Only the leaf particles are ground – not the stem or leaf skeleton. It is important to select the best and finest organic quality. The tea is prepared by pouring a modicum of hot water over a small amount of the powder and beating the mixture to a smooth, uniform consistency with a bamboo whisk until it becomes frothy. Matcha prepared in this way is classed as a food product, but it is also available in powder or capsule form, making it suitable for use as a dietary supplement.

In contrast to normal leaf teas which release only a fraction of their active ingredients through infusion in hot water, the whole tea leaf with all its valuable substances is ingested 100% in the case of matcha powder. As a result, matcha tea contains roughly 15 times more active ingredients than any other conventional sort of green tea. It is also particularly rich in antioxidants. One of these, epigallocatechin gallate (EGCG), a catechin and very potent antioxidant, belongs to the flavonoids, a subcategory of polyphenols.

A host of positive effects are attributed to EGCG. According to some studies, it may have an anti-inflammatory effect, as well as a positive effect on disorders of the immune system. Studies also indicate health-promoting ef-



fects with cancer. It appears to inhibit tumour growth. EGCG is even being investigated in Alzheimer's research. Researchers hope that the extract from green tea might prevent the disease at a very early stage. However, it is not yet clear whether EGCG alone is responsible for these effects. Scientists also consider it possible that there are interactions with other ingredients. Apart from this, it would be necessary to drink large amounts every day rather than a 100 millilitre cup.

Matcha capsules supply energy and have other properties which have a positive effect on the human organism:

- A high catechin content (up to 15%), and thus a high content of antioxidants. Matcha is rich in vitamin A, C, E and B complex and contains 900% more beta carotene than spinach.
- The caffeine is bound to tannins, which slows down release into the bloodstream.

Matcha capsules were developed for consumers who want to benefit from its advantages and energising effect in a quick, uncomplicated, efficient way. The key argument in favour of capsules is that they are easy to take.

The effects of green tea such as matcha have been investigated over a long period of time. The Australian website Archeus provides a good overview of the scientific studies:

- As early as 1994 the British *Journal of the National Cancer Institute* published the results of an epidemiological study indicating that drinking green tea reduced the risk of oesophageal cancer in Chinese men and women by nearly sixty per cent. Researchers from the University of Purdue, West Lafayette, Indiana, recently concluded that a compound in green tea inhibits the growth of cancer cells
- Antioxidant compounds (catechins) in green tea could help promote exercise-induced abdominal fat loss, according to a new study from the *American Journal of Clinical Nutrition*.



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- In a study reported on in the *American Journal of Clinical Nutrition*, it was found that green tea extract resulted in a significant increase in energy expenditure (which is a measure of metabolism), as well as having a significant effect on fat oxidation.
- A study tested the effect of regularly taking green tea extract and found that over 10 weeks, endurance exercise performance was boosted by up to 24% with 0.5% green tea extract supplementation and by up to 8% with 0.2% by-weight addition to food. Reporting in the online edition of the *American Journal of Physiology-Regulatory, Integrative and Comparative Physiology*, researchers at the Biological Sciences Laboratories of Kao Corp., Tochigi, Japan, said the 8–24% increase in swimming time-to-exhaustion was “accompanied by lower respiratory quotients and higher rates of fat oxidation.”
- Drinking green tea could modulate the effect of smoking on lung cancer. Results of a hospital-based, randomised study conducted in Taiwan were presented at the AACR-IASLC Joint Conference on Mole-

cular Origins of Lung Cancer, held 11-14 January 2010.

- A study published in the *Journal of Periodontology* revealed yet another benefit of green tea consumption. Researchers found that routine intake of green tea may also help promote healthy teeth and gums. The study analysed the periodontal health of 940 men, and found that the periodontal health of those who regularly drank green tea was superior to that of subjects who consumed less green tea.
- Seven cups of green tea a day over the long term may massively reduce the risk of death from colorectal cancer and heart disease. This is suggested by a new study from Japan. Compared to results in people drinking less than one cup a day, seven or more cups of green tea a day may reduce the risk of dying from heart disease by a massive 75 per cent, as reported by scientists from Okayama University in the *Annals of Epidemiology*.

In summary, it can be said that whether as a powder for blending with hot water or in capsule form, matcha has a positive all-round effect on the immune system. This has led to new marketing forms being developed, such as matcha white sausage, matcha lemonade and matcha smoothie

Matcha white sausage is in fact pea-green in colour. It provides all the benefits of matcha. Its inventor Werner Gropp and co-creator butcher Markus Hinterberger recognised the potential of ground green matcha tea as a condiment due to the possibility of using the whole leaf with all its properties. The experiment was an immediate success. The traditional Bavarian Weisswurst was enhanced by the green colour and refined by the slightly tart flavour.

Matcha powder can also be mixed into drinks or fruit purees, in which case its earthy taste dissipates. This wide range of possibilities makes matcha ideal for introducing new health trends into the diet.

**Conclusion >** Scientific methods of analysis have improved continually in recent decades. Besides classic animal experiments, ethically justifiable studies are also carried out directly on humans. If these findings are not yet conclusive – as in the case of moringa – it is advisable to use such supplements with caution. It can easily happen that an overdose ends up doing more harm than good. A larger number of studies are available on the effectiveness of green tea such as matcha. These definitely show a positive effect on well-being.

Nevertheless, legislators must stem the tide of effusive marketing of these “positive” properties. Legislators act as a sort of shield for the consumer, who would otherwise be unable to distinguish between serious and misleading offers. At the same time, consumers themselves should exercise caution as a general measure, since these products are not part of our normal diet and we lack experience with the dosage. You can also get too much of a good thing!

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