



Green Soybean Seed

In very dry years, when soy stands reach premature ripeness, soybeans with a greenish sheen can frequently be observed (Fig. 1).



Figure 1: Soybeans with a green shimmer (premature ripe) compared with normally ripened soybeans (Taifun-Tofu GmbH)

(Pre)mature beans with a green shimmer are to be distinguished from unripe, green beans. The latter are larger and moister (Fig. 2). For differentiation, the terms "beans with a green shimmer" or



Figure 2: Green, unripe soybeans with high water content (Taifun-Tofu GmbH)

"premature ripe beans" are used in the following. Strong occurrence of beans with a green shimmer was observed in Germany in the years 2003 and 2015, in Lower Austria also in 2012. At the beginning of September 2012, up to 40% of green or green-shimmering beans were recorded on dry sites in the Taifun contract farming. Besides high temperatures and water shortage, pest infestation (mainly bugs) and diseases are mentioned in the relevant literature as a cause for premature ripening and green colouring. In general, the problem is most severe for extreme drought in July and August on light soils with low usable field capacity. In the premature, dry soybeans, the enzyme activity comes to a halt. This also affects the enzymes that break down green chlorophyll. As a result, the green colour of the beans is retained (OMAFRA 2009).

The degree of green colouring depends on the developmental stage of the plant, in which early drying or ripening occurs. If the extreme environmental conditions do not set in until the final phase of grain filling, the green colour is limited to the outer hull. In this case, the green shimmer may even be reduced during storage after harvesting. Drought stress in the early stages of grain filling, on the other hand, leads to a green colouring of the whole bean and is not reversible (EMPRAPA 2012a).

Influence on plant ingredients and processing quality

Since proteins are enriched in the bean at the beginning of the ripening process, beans with a green shimmer often have normal protein contents, as repeated investigations in Taifun contract farming have shown. Yet, the stability of the water/oil emulsion of isolated soy proteins from ripe beans is considerably higher than that of prematurely ripened beans.

The reason for this lies in the higher proportion of the 7S protein substance in ripe beans, which form a more stable emulsion. In the prematurely ripened beans, the 11S protein substance content is higher, which leads to less stable emulsions. The high 11S content of green beans on the other hand promotes the formation of stronger protein gels (EMPRAPA 2012a).

As the oil enrichment in the beans takes place in the final ripening phase, the oil content of beans with a green shimmer can be reduced.

Soybeans with a green shimmer can lead to problems during processing as they colour end products such as soybean oil or protein isolates. In tofu, these beans cause a greenish shimmer and a grassy taste. For this reason, the tofu manufacturer Taifun reserves the right in its terms of delivery to reimburse (and use) batches with more than 5% green shimmer as animal feed.

Removal of green beans by cleaning



Figure 3: Various differently coloured beans sorted out by a colour sorter. Among them also many beans with green shimmer (Taifun-Tofu GmbH)

As green, not properly ripened soybeans are often more irregular or elongated than normally ripened beans, it is possible to clean them out using a spiral separator (see also [Taifun Soy Info "Spiral separators for cleaning soybeans"](#)). In a test, the proportion of beans with a green shimmer could be halved using this approach (EMBRAPA 2012b).

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Author: Martin Miersch
Translation: Stefan Paul
Publisher: Taifun-Tofu GmbH
Bebelstraße 8 | 79108 Freiburg |
Tel. 0761 152 10 13
soja@taifun-tofu.de

Colour sorters work much more accurately. In our own tests with a CIMBRIA SEA CHROME, differently coloured soybeans - not only those with a green shimmer - could be almost completely cleaned out of a batch (Fig. 3).

Literature

EMBRAPA 2012a: Grãos verdes: influência na qualidade dos produtos à base de soja. Circular Técnica 90

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Taifun
Zentrum für
Sojaanbau