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Authentic flavour – a case study with Teltow Turnips*

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Summary

Teltow Turnips have a well documented history regarding the cultivation in the Teltow area and their unique quality – mostly reported in terms of culinary appreciation. The flavour authenticity could not be reproduced from verbal and depicted sources. Therefore a sensory authenticity test with former or private producers and professional users from gastronomy was conducted. A catalogue of 34 attributes was developed and tested with unknown material. Nine flavour attributes proved to be applicable for highly significant separation of samples. Cluster analysis showed the close sensory relationship of Teltow Turnip selections compared to similar turnips sold on the market as Teltow Turnips, too. Instrumental analysis of flavour-relevant compounds resulted in higher values of total glucosinolates (>100 mg / 100 g FM), sucrose (>3.0 g / 10 g) and dry matter (> 14 %) for those turnips considered as original.

Introduction

Cultivation of Teltow Turnips (*Brassica rapa* var. *rapa pygmaea teltoviensis*) in Brandenburg state is well documented (BECKER-DILLINGEN, 1956). Mostly the unique flavour quality is emphasised. The production of this speciality has been disregarded for many decades. The tradition how to cultivate the turnips was kept in private gardens only.

In the last ten years the interest in this traditional product aroused again and could offer an additional market chance for horticultural enterprises. To protect the market for local production and gastronomy "Teltow Turnip" was registered as a brand name (Deutsches Patentamt, 2/083 900, Aktenzeichen: V24612/31Wz).

There is a remarkable production of turnip varieties outside Brandenburg, e.g. France with a production of 72000 t in 1996 (BEHR, 1997) or in the Hamburg area. In both cases products are named as Teltow Turnips, but flavour, shape and colour are different from the origin. Therefore it was necessary to develop criteria for an objective definition of Teltow Turnip product. The term "Teltow Turnip" is distinguished only verbally according to the genotype and the attribute occurrence and intensities. In addition, there are different selections which might not show the typical flavour, internal colour and shape as does the usually grown landrace according to the "Heimatverein Teltow e.V."

Therefore the aim of this study was to identify the typical attributes of the Teltow Turnip, grown in the Teltow area, to define the product and to distinguish it from similar products on the market.

Material and methods

A focus group was organised inviting former or private producers of Teltow Turnips and professional users from gastronomy. Attributes were collected, which were considered to be typical and characterising. With the use of different sample material, including selections of Teltow Turnips of different growth sites in the Teltow area and similar products from abroad, descriptors were named for appearance and odour of whole turnips, odour, flavour and mouth feeling of raw and cooked material. All descriptors were discussed and included, when the group members agreed, that they were appropriate to characterise and distinguish the turnips. The catalogue of 34 attributes (Tab. 1, Tab. 2, Tab. 3) was aimed to contain few but all important attributes as a basis for the sensory tests.

Tab. 1: Attributes to apply on whole turnips

critereon	specifications
shape	slim, longitudinal shape or rotund swelling at the neck
size	length and respective diameter
colour	white, cream white or different colour
side roots	amount of roots and distribution of insertion
vertical indentation	number and position of parallel to growth axis
horizontally stripes	number and position of thickened, corked or discoloured bands
odour generated by scratching	odour note after superficial surface scratching

Tab. 2: Attributes to apply on diced, raw turnips

critereon	specifications
general odour	like: swede, radish, potato, sweetish, stinging, earthy
general flavour	like: swede, radish, earthy, pungent, sweet, bitter
mouth feeling	bite firmness
aftertaste	typical

Tab. 3: Attributes to apply on diced, cooked turnips

critereon	specifications
general odour	like: swede, radish, potato, sweetish, stinging, earthy
general flavour	like: swede, radish, pungent, sweet, bitter
mouth feeling	mealiness
aftertaste	typical

Sensory test

Sensory tests were conducted to prove the applicability of the selected attributes to differentiate previously unknown material and to identify attribute profiles, which reflect the original product.

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Plant material

Three selections from different provenances within the Teltow area, which resembled the traditional appearance of Teltow Turnips were included. The provenance 'Teltow' was grown from seed, which has been reproduced during several decades, 'Beelitz' was grown from commercial seed 'Teltower Kleine' purchased from Hild Samen GmbH, Marbach/Neckar, Germany in combination with seed from own reproduction. 'Großbeeren' turnips were grown from 'Teltower Kleine' seed by Hild Samen GmbH. Harvest was in the 44th week and turnips were stored at 2-6 °C until week 50, when analyses took place.

Similar products on the marketplace, sold as "Teltow Turnips" and produced near Hamburg were purchased from Fruchthof, Berlin and seed of 'Goldball', also sold as "Teltower Rübchen", was obtained from Enza Zaden, Dannstadt-Schauernheim, Germany and grown, harvested and stored in Großbeeren under the same conditions as the selection 'Großbeeren'.

Sample preparation

For sample preparation turnips were washed with tap water and soil removed by soft brushing. Whole turnips were presented to the judges on a white plate. For judgement of raw, diced material, cleaned turnips were divided into 4 vertical pieces and each of them cut horizontally. 25 g of the four internal pieces were presented in a clear, closed 125 ml plastic container. For cooked material, whole cleaned turnips were heated in an AMC® pot over steam, without pressure for 10 min and then submerged in cold tap water for few seconds. When cold, turnips were cut and packed as the raw samples.

Test procedure

The sensory authenticity test was conducted with 9 members of the "Heimatverein Teltow e.V." – experienced growers and professional users. In a standardised sensory lab, for details see BRÜCKNER et al. (2005), the judges received single samples one after the other in a random order. For each of the attributes from the catalogue it had to be judged and marked on a unstructured line scale (0 – 100), whether the perceived intensity of the sample is close to the association of original Teltow Turnips (100) or not (0).

Results and discussion

Almost all of the attributes could separate the samples significantly. Among the characterising attributes, with the highest F-values (>8) were all the attributes which were applied on whole turnips; general, radish-like and pungent flavour, firmness and aftertaste, when turnips were tasted raw. When cooked, the following attributes allowed for best separation of the samples: general and radish-like odour, general, swede-like, radish-like, pungent and sweet flavour, mealy mouth feeling and typical aftertaste. Fig. 1 gives the result of cluster analysis. These nine attributes of cooked turnip dices, which distinguished the samples with lowest error probabilities were included. The Euclidean distance (degree of dissimilarity) was below 30 between the three Teltow Turnip selections, whereas the distance to the other turnips was around 65.

Fig. 2 depicts the closeness of the attributes for cooked turnip dices to the original Teltow Turnips. There was some variation among the three samples, which are considered to be original. The Teltow selection was judged to be less typical in general odour, flavour attributes and aftertaste, whereas the Großbeeren samples were less typical in sweetness, but their mealiness was closer to the original

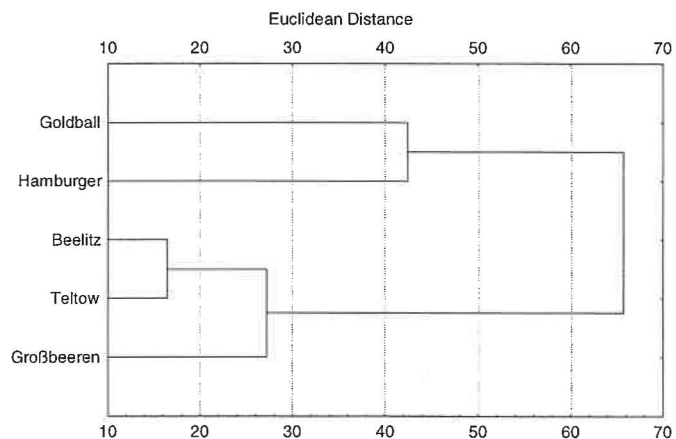


Fig. 1: Result of cluster analysis. Goldball and Hamburger are clearly separated from the Teltow Turnip selections Beelitz, Teltow and Großbeeren. For analysis those attributes of cooked turnip dices were used, which distinguished the 5 samples best ($F > 8$): general and radish-like odour, general, swede-like, radish-like, pungent and sweet flavour, mealy mouth feeling and typical aftertaste.

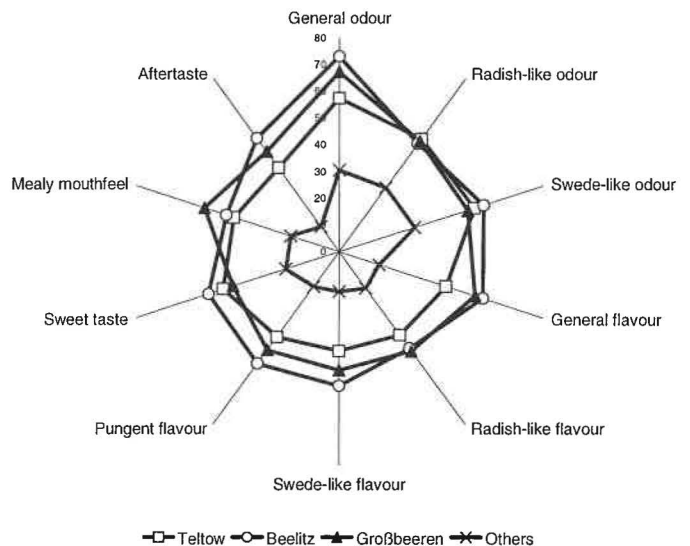


Fig. 2: Sensory profile of the Teltow Turnip selections Beelitz, Teltow and Großbeeren and other turnips in the test (Goldball and Hamburger). For analysis nine attributes of cooked turnip dices were included.

than the other samples. Hamburger turnips' and Goldball attributes were judged to be far from original.

The levels of total glucosinolates, present in the *Brassica*-family are partly associated with the typical harsh and pungent notes of the vegetables of this plant family (FENWICK et al., 1983; HANSEN et al., 1997; ENGEL et al., 2002). Therefore the total glucosinolate contents of the turnips were analysed by SCHONHOF et al. (1999). The contents differed between the two groups, which were separated by cluster analysis, based on the flavour authenticity. The three Teltow Turnip selections contained 158 to 178 mg / 100 g FM (Beelitz (166 mg), Teltow (178 mg) and Großbeeren (158 mg)), whereas the other turnips contained 55 (Hamburger) and 69 mg / 100 g FM (Goldball).

The sugar contents were analysed by SCHONHOF et al. (1999). The total sugar contents differed between the samples, Hamburger and Goldball had significantly lower contents than the other turnips (Tab. 4). This was mainly caused by the very low sucrose content

Tab. 4: Contents of sugars in the turnip samples. Different subscript letters in a row indicate significant differences at the $p=0.05$ level.

g / 100 g FM	Hamburger	Goldball	Beelitz	Teltow	Großbeeren
Fructose	1.27 c	1.31 c	0.15 a	0.39 b	1.48 d
Glucose	2.44 d	2.54 d	0.38 a	0.86 b	2.11 c
Sucrose	0.30 a	0.36 a	4.77 c	3.95 b	4.54 c
total sugars	4.00 a	4.21 a	5.19 b	5.30 b	8.12 c

compared to the three Teltow Turnip selections (Beelitz, Teltow and Großbeeren), see Tab. 4. The contents of reducing sugars varied. Low levels occurred in the Beelitz and Teltow provenance, whereas Großbeeren, Hamburger and Goldball* samples showed elevated values.

The influence of the size of the turnips on their sugar content was tested with the Beelitz selection. Turnips with a diameter of 20-35 mm were compared to those of 35-50 mm and were analysed separately. Tab. 5 shows, that there were no significant differences.

Tab. 5: Contents of sugars in the Beelitz turnip samples of different size. Different subscript letters in a row indicate significant differences at the $p=0.05$ level.

g / 100 g FM	20-35 mm	35-50 mm
Fructose	0.15 a	0.20 a
Glucose	0.38 a	0.42 a
Sucrose	4.77 a	4.66 a
total sugars	5.30 a	5.30 a

The typical mealy mouth feeling prevalent in the Teltow Turnip group may be associated with the high dry matter content, which amounted to 16 to 19 % in this group, much more than 8 % in Hamburger or 10 % in Goldball turnips or in comparable *Brassica* or *Raphanus* tubers (ANONYMOUS, 2000).

Conclusion

The sensory authenticity test with former or private producers and professional users from gastronomy filled the gap between well documented product description including the emphasised culinary appreciation and lack of reproducible information on sensory profiles of the product. The testers developed a catalogue of important and

characterising attributes, which was appropriate to distinguish samples, which can be considered as original and those with non typical attributes. Only with this information, analytically determined flavour relevant properties could be assigned to the authentic Teltow Turnip samples.

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