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Verification of the True 'Witte' Pecan and Naming of the 'Martzahn' Cultivar

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Abstract

A discrepancy in the identification of the pecan [*Carya illinoinensis* (Wangenh.) K. Koch] cultivar 'Witte' has been resolved by a combination of techniques, including comparison of voucher specimens and evaluation records, supplemented by isozyme analysis. The origin of the error is traced in hopes of extricating accurate cultivar evaluation information on the historic cultivar, from evaluation records of a previously unnamed accession. A name, 'Martzahn', is given to that accession to facilitate separation of the two entities.

A discrepancy has been resolved in the identification of the historic Iowa pecan cultivar, 'Witte.' The resolution of this discrepancy is important for several reasons: misidentified trees can be correctly identified; propagation of the error can be stopped; evaluation data incorrectly attributed to the cultivar can be eliminated from its record; and finally, corrected or new appellations can be attached to inventories previously misidentified. In order to accomplish this, the history of both the cultivar and the error must be traced.

Historical

The pecan cultivar 'Witte' originated as a native seedling in Burlington, Iowa (10). The original tree was found as the result of a systematic effort by J. F. Jones to find pecans adapted to a northern climate. In 1914, Jones "engaged the services of a competent man to gather pecans" near Muscatine, Iowa (10). None were found to be worthy of propagation. That same autumn, nuts from Burlington, Iowa were sent to G. H. Corsan in Toronto, Canada, who was also searching for hardy, north-

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ern pecan stocks. Corsan was surprised by the large nut size, and assumed they were from a southern source. His supplier assured him that they were from hardy Iowa pecan trees. In 1915, Corsan encouraged Jones to concentrate his search in the Burlington area. Jones contacted E. G. Marquardt, of Burlington, who employed a man familiar with the trees in the area to locate trees bearing large, thin-shelled, high quality nuts. The 'Marquardt' hybrid was found that year. Recognizing the value of the Iowa nut trees and the threat to them posed by the damming of the Mississippi River at Keokuk, Iowa, the search for high quality pecans was continued in subsequent years. In 1918, W. G. Bixby searched the area near Clinton and Burlington and found that nuts at Clinton were smaller and not worthy of propagation. At Burlington, four trees were "discovered and brought to the attention of the association by Mr. E. G. Marquardt and Mr. John H. Witte of Burlington" (10). These were named 'Marquardt,' 'Burlington,' 'Greenbay,' and 'Witte.' Only 'Witte' is a true pecan, while the other three are hybrids between pecan and *Carya laciniosa* (F. Michx.) Loudon (= *Carya X nussbaumeri* Sarg). The 'Marquardt' was propagated by Jones in his Lancaster, Pa., nursery while D. C. Snyder of Center Point, Iowa, propagated the other three cultivars. A photograph, showing nuts of all four cultivars (10), serves as a 'type' or voucher for 'Witte' (Fig. 1a).

'Witte' was mentioned in reports (1, 2, 4) and listed in orchards and exhibits at Northern Nut Growers meetings (21, 22, 23). However, 10 years after the cultivar's origin, the survey of 1929 found only seven trees of 'Witte' (26). Knowledgeable growers suggested that the cultivar be placed on the "obsolete list" (5). 'Witte' continued to be exhibited by D. C. Snyder, the nurseryman responsible for its initial propagation (23). 'Witte' was noted as an extremely early flowering pecan (13,14). It was described as "protandrous, by observations of Mr. D. C. Snyder, Center Point, Iowa, where it is the most vigorous, productive and best maturing pecan variety so far tested in an average growing season of about 160 days" (14). McDaniel (15) made observations with Frank Martzahn of Davenport, Iowa, and reaffirmed that 'Witte' is protandrous.

'Witte' was first introduced into the U.S. Dept. of Agriculture-Agricultural Research Service (USDA-ARS) Pecan Breeding program by Louis Romberg, who obtained scion wood from an unknown source in 1960, and grafted a tree (BRW 85-12) at the USDA-ARS Pecan Field Station, Brownwood, Texas. The origin of 'Witte' was described in the "Regis-

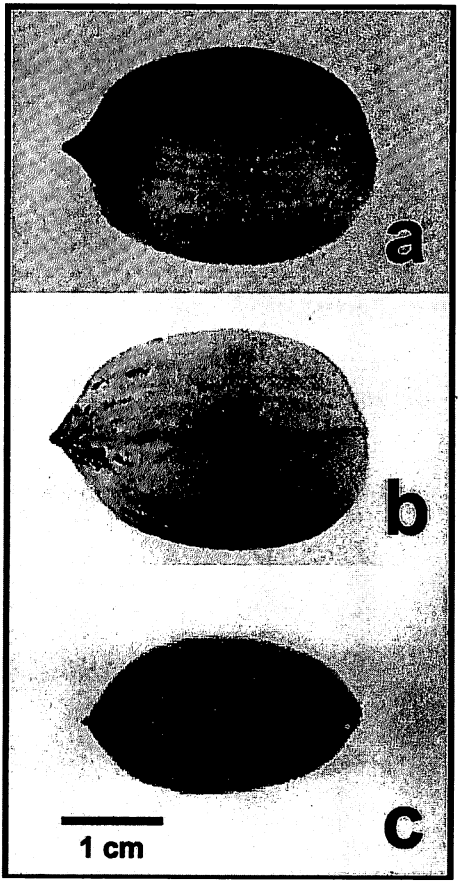

Figure 1. a. Nut of original 'Witte' tree (Jones, 1919). b. Nut of 'Witte', USDA-ARS inventory BW 85-12 (Thompson and Young, 1985). c. 'Witte' = 'Martzahn', Univ. of Nebraska, Y-14, 1998 crop. Centimeter scale applies to all photos.

ter of new fruit and nut varieties: List 16" (3) based on summary descriptions made by Glenn KenKnight, of USDA-ARS. 'Witte' was used as a pollen parent in the USDA-ARS Pecan Breeding Program in 1966 (11), to pollinate receptive flowers of several cultivars. When the USDA orchard was thinned in 1983, tree BW 85-12 was removed, but graftwood was transferred to another tree (BW 111-18). Thompson and Young (24) provided information on cultivar origin, dichogamy (protandrous) and literature references, along with a photograph of nuts produced by tree BW 85-12 (Fig. 1b), in which nut shape matches the nut photographed by Jones (10).

Researchers at the University of Nebraska, led by W. A. Gustafson, initiated a northern pecan research project in 1980. 'Witte' was among the 57 cultivars identified for testing (9). Scions were obtained in 1981 from the "Frank Martzahn source." Martzahn, who had worked with J. C. McDaniel on 'Witte' in the 1950s and knew the cultivar well, died in the June 1980 and was therefore not available to verify the source tree. The Martzahn tree was the foundation of the records identified as 'Witte' in the Nebraska test, but is not the historic 'Witte' (Fig. 1c). Evaluation records of the Nebraska test orchard have been regularly reported at meetings of the Northern Nut Growers Association (7, 16, 17, 18, 19, 20). Those records indicate that trees identified as 'Witte' in the test are protogynous and produce a very small nut that ripens extremely early, up to 3 weeks before 'Colby.'

The discrepancy in the identification of 'Witte' became apparent in the late 1980s, when William Reid, of Chetopa Kansas, noted that the trees in the Nebraska test produced smaller nuts than those from other sources (Wm. Reid, personal communication; 25). Reid had obtained his graftwood of 'Witte' from Gilbert McDowell, of Nevada, Mo., who had obtained it from an unknown source about 1980 (G. McDowell, personal communication). In an effort to resolve the discrepancy, Gustafson obtained wood of 'Witte' from McDowell in 1988, and the USDA-ARS National Clonal Germplasm Repository (NCGR) obtained wood from Reid in 1991 and grafted the tree NGR 7-13 at Brownwood, Texas. Since the historic accession originated in Iowa, it was designated as 'Witte' (IA). The Nebraska accession had supposedly been obtained from original sources in Iowa, and was long assumed to have been accurately identified. The primary source of the alternative accession was Missouri, and that cultivar was referred to as 'Witte' (MO).

The NCGR collections were evaluated using isozyme analysis in the early '90s (12). The two sources of 'Witte' in the collections could not be distinguished since both accessions represented the true 'Witte.'

Sparks (25) referred to the confusion related to the 'Witte,' but attached the passport information for the original Iowa cultivar to the characterization information from the Nebraska accessions. The inconsistencies between the dichogamy records and nut characteristics were not addressed. The photograph (25) does not match that of Jones (10) or Thompson and Young (24).

Re-evaluation of Data

Nuts from the USDA-ARS accession of 'Witte' BW 111-18 were photographed in 1995 and may be viewed at the website of the USDA-ARS Pecan Breeding and Ge-

Table 1. Dimensions of 'Witte' and 'Martzahn' nuts from various sources.

Accession	Source	Inventory	Nut length (cm)	Nut height (cm)	Length/height ratio
'Witte'	Jones (photo)	Ortet	3.2	2.1	1.5
'Witte'	Thompson & Young (photo)	BRW 85-12	3.3	2.1	1.6
'Witte'	Grauke (10 nuts)	BRW 111-18	3.7	2.2	1.7
'Martzahn'	NeNNR	Y-14	2.9	1.7	1.8

Table 2. Characteristics of nuts of 'Witte' and 'Martzahn' nuts from various sources.

Accession	Source	Inventory	Crop year	Nut mass (g)	Nuts/lb.	Kernel %
'Witte'	BW	85-12	1965	6.35	71	48.3
'Witte'	BW	111-18	1995	6.87	66	49.7
'Witte'	Kansas	bulk	1993	6.47	70	51.1
'Witte'	Kansas	bulk	1994	6.88	66	52.6
'Witte'	Kansas	bulk	1995	4.50	101	44.5
'Witte'	Kansas	bulk	1996	6.06	75	51.4
'Witte'	Kansas	bulk	1997	6.11	74	50.6
'Witte'	Kansas	bulk	1998	5.25	86	50.8
'Martzahn'	NeNNR	Y-14	1993	3.68	123	45.9
'Martzahn'	NeNNR	Y-14	1993	3.33	136	48.3
'Martzahn'	NeNNR	Y-37	1993	3.31	137	47.8
'Martzahn'	NeNNR	W-6	1993	2.78	163	48.5
'Martzahn'	NeNNR	W-6	1993	3.31	137	48.2
'Martzahn'	NeNNR	W-7	1997	3.91	116	52.9
'Martzahn'	NeNNR	Y-13	1997	3.34	135	51.6

netics Program (http://extension-horticulture.tamu.edu/carya). Nuts are comparable to the original photos of the cultivar (10) and those published by Thompson and Young (24). Trees of 'Witte' in the NCGR collections have been evaluated for dichogamy and are protandrous. At the website and in descriptions of the cultivar prepared for the Brooks and Olmo Register of Fruit and Nut Varieties, 3rd edition (6), 'Witte' nuts are correctly described and the historic passport information is accurate. However, the date of nut ripening is based on the evaluation records from the Martzahn source, and is therefore not accurate. The true 'Witte' ripens coincidentally with 'Colby' rather than 3 weeks before it. 'Witte' nuts begin to dehisce from involucres in late August in Brownwood, Texas, and reach 75% split in early September.

The extremely early nut maturation of the trees in the Nebraska study may justify continued evaluation of that accession. Furthermore, scion wood has been distributed that must be differentiated from the true 'Witte.' The name 'Martzahn' should be used for this accession. That name accurately designates the original source of the material, and recognizes the role played by Frank Martzahn in the evaluation of Iowa nut trees. Characterization of nuts is based on samples and data from the Nebraska Northern Pecan Research program (8) (Tables 1 and 2). The description below follows the form used for describing cultivars in the Brooks and Olmo Register:

'Martzahn' originated as a seedling tree near Burlington, Iowa, on property of Frank Martzahn. Mistakenly propagated as 'Witte' in the Northern Nut Research Orchard in Nebraska (NeNNR), Lincoln, Nebr., in 1981. The nut is described as follows: elliptic with acute apex and acute, often asymmetric, base; 116-163 nuts/lb [=255-359 nuts/kg], 46-53% kernel; kernels with narrow to medium dorsal grooves, essentially lacking secondary dorsal grooves or basal cleft. Protogynous, with early to mid-season receptivity and late pollen shed. Extremely early nut maturity, about 3 weeks before 'Colby.'

Summary and Conclusions

Tracing the history of these relatively obscure accessions was made possible by several factors that deserve mention. The Northern Nut Growers Association has played a dominant role in the recognition, acquisition, documentation, characterization, and evaluation of valuable northern nut germplasm since the early part of this century, and continues to lead work in the area. The meticulous establishment records maintained by the Nebraska Northern Pecan project are exemplary, and

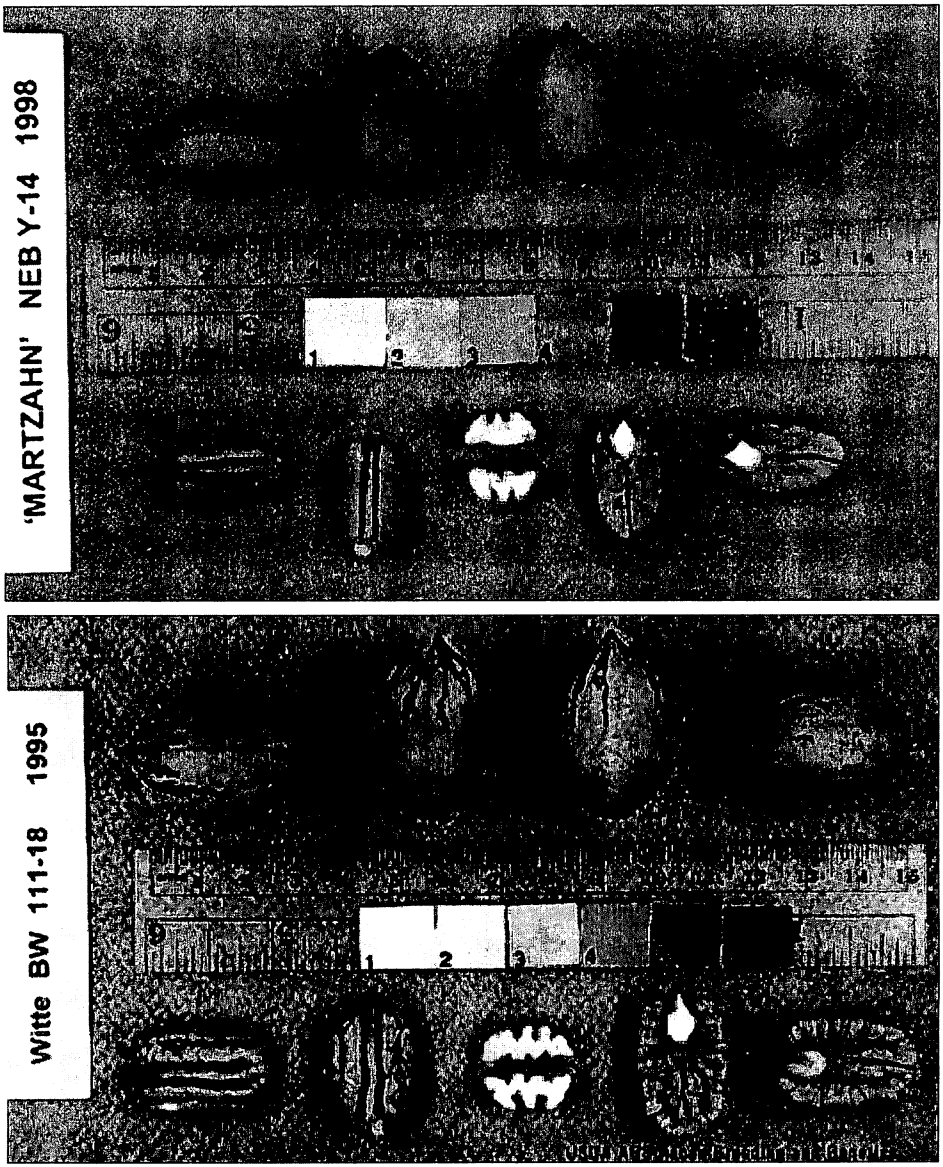

Fig. 2. Vouchers of 'Martzahn' (above) and 'Witte' (below) from the USDA ARS Pecan Breeding and Genetics Program website (http://extension-horticulture.tamu.edu/carya).

their open access has permitted correction of this discrepancy, as have the careful field observations of Wm. Reid and Cyril Bish. The USDA-ARS National Clonal Germplasm Repository has functioned as a reliable storehouse of germplasm and information, due largely to a long history of careful involvement.

The evaluation of this situation reinforces the need for critical verification procedures. Cultivars should be verified at the individual tree inventory level. Tradition-

ally, verification is accomplished by comparing nuts from a recently propagated inventory with vouchers collected from previously verified inventories. Maintenance of nut vouchers from verified inventories is a long-standing function of the USDA-ARS Pecan Repository. Inconsistencies in characteristics such as nut shape or dichogamy should be investigated during the verification process. Records should be maintained showing inventory records of graftwood sources and samples used for verification, as in Nebraska.

Photographic vouchers can be quite useful in verification, even when they lack intrinsic scales. Jones (10) provided a black and white photo of a single polished nut, lacking kernels and without scale, although reproduced at natural size. Thompson and Young (24) provided a black and white photo of two unpolished nuts from dorsal and lateral views. The photo lacks kernels and has no scale, but is reproduced at natural size. The black and white photo in Sparks (25) has no index to scale and is not reproduced natural size, although a common magnification was used in all photos to allow comparison. Color photos at the website of the USDA-ARS Pecan Breeding and Genetics Program (Fig. 2) include a scale, color correction key with Munsell color chips, and accession inventory showing the year of sample collection. Multiple nuts are arranged to show dorsal and lateral views of both nuts and kernels.

Characterization and evaluation records should be carefully linked with verified inventories. This is increasingly important as samples are taken from trees for use in molecular genetic characterization. Evaluation data from a replicated test is more reliable than that derived from observation of only one inventory of a cultivar. However, until each replicate of the cultivar has been verified in such a test, the evaluation data should be considered suspect. By publishing photos of verified cultivar inventories at the USDA ARS Pecan Breeding and Genetics website, the NCGR for Pecans and Hickories hopes to facilitate the verification process. Although isozyme analysis and other molecular genetics characterizations may someday allow fingerprinting of genotypes, verification by voucher comparison will remain the procedure used by most workers for the foreseeable future.

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Delay of Deacclimation of Grape by Dormant Oil

JMS stylet oil or soybean oil at 20% killed primary buds of "Seyval" but 10% soybean and 5% JMS stylet oil were non-toxic and delayed spring bud break by 3 to 6 days or 15 days respectively. 'Concord' had greater delay in bud break (6-18 days) than 'Cabernet Sauvignon' (5 to 7 days). Winter applications were more effective than spring. soybean oil at 8% had no effect on field, components of 'Concord' or 'Cabernet Sauvignon.' From Dami and Wolf. 1999. Amer. J. Enol. and vit. 50(3):375.

Effect of Trellis System on Vignoles

Divided canopy systems (Scott Henry, Geneva Double Curtain) had more retained nodes, more clusters and higher yield per vine than single curtain systems (Low Cordon, High Cordon). Scott Henry vines had the lowest incidence and severity of harvest season cluster rot complex. From Gu et al. 1999. Amer. J. Enol and Vit. 50(3):377.

Grow-Tube Microenvironment

Photosynthesis was reduced by all grow tube types due to a reduction in light. Water relations was universally improved and appeared to be the pruning factor associated with improved grapevine growth. Grow tubes increase humidity in the microenvironment around the grapevine which causes an increase in water potential. Thus vines in tubes have more water available for growth. Current information indicates a reduction in cold hardiness during periods of high solar radiation with tubes having moderate to high light transmission characteristics. Thus tubes should be removed in regions where low temperatures can occur. From Wample et al. 1999. Amer. J. Enol. and Vit. 50(3):369.