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UPOV

INTERNATIONAL UNION FOR THE PROTECTION OF NEW VARIETIES OF PLANTS

GENEVA

TECHNICAL WORKING PARTY FOR VEGETABLES

Forty-Fifth Session
Monterey, United States of America
July 25 to 29, 2011

EXPERIENCES WITH NEW TYPES AND SPECIES
WATERCRESS

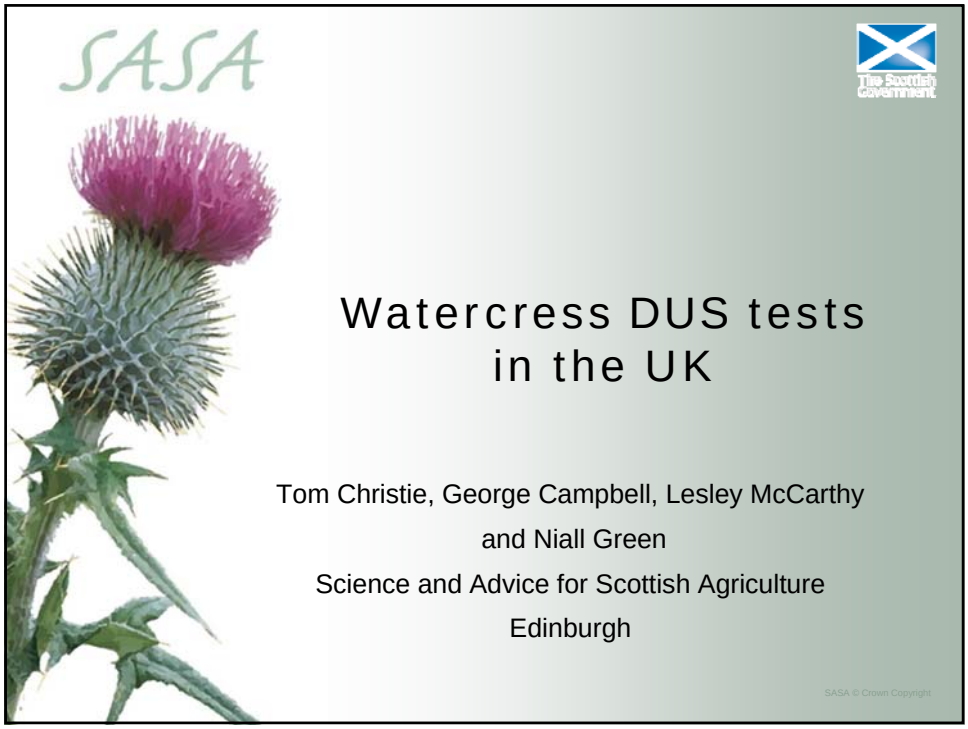
Documents prepared by experts from the United Kingdom

1. The Technical Working Party for Vegetables (TWV), at its forty-fourth session, held in Veliko Tarnovo, Bulgaria, from July 5 to 9, 2010, agreed to invite the United Kingdom to make a report to the TWV, at its forty-fifth session, on its experience in establishing a DUS examination for vegetatively propagated varieties of Watercress (see document TWV/44/34 "Report", paragraph 92).

2. The Annex to this document contains a presentation on "Watercress in DUS test in the United Kingdom".

[Annex follows]

ANNEX


SASA
The Scottish Government
Watercress DUS tests in the UK
Tom Christie, George Campbell, Lesley McCarthy
and Niall Green
Science and Advice for Scottish Agriculture
Edinburgh
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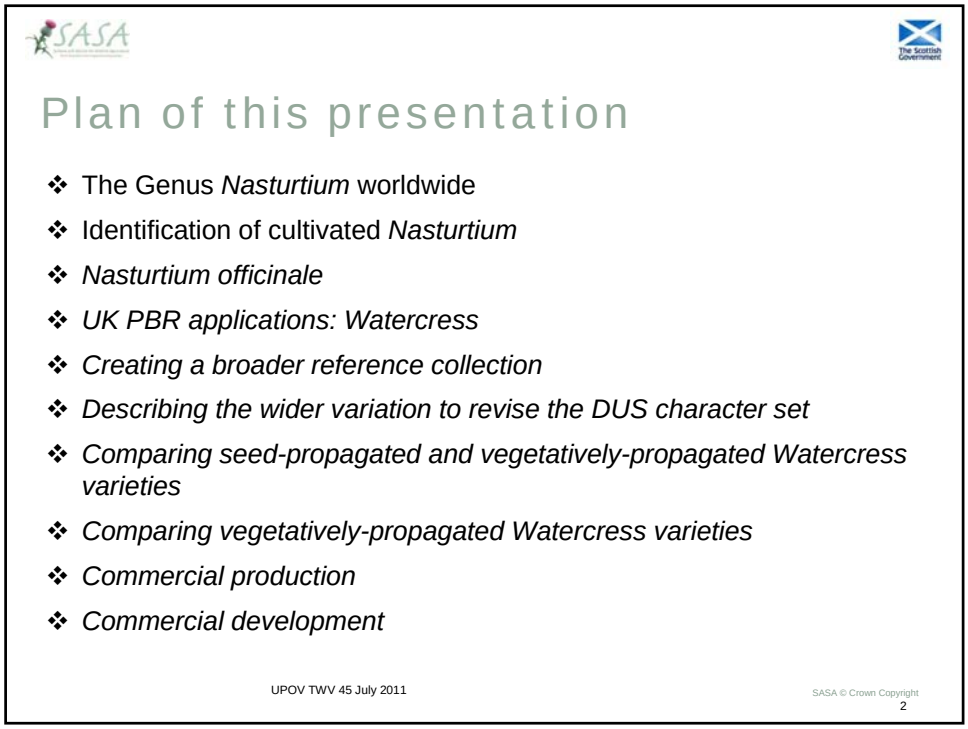
SASA
The Scottish Government
Plan of this presentation
The Genus Nasturtium worldwide
Identification of cultivated Nasturtium
Nasturtium officinale
UK PBR applications: Watercress
Creating a broader reference collection
Describing the wider variation to revise the DUS character set
Comparing seed-propagated and vegetatively-propagated Watercress varieties
Comparing vegetatively-propagated Watercress varieties
Commercial production
Commercial development
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The Genus Nasturtium worldwide

Nasturtium (renamed from Rorippa): 5 species (all with white flowers)

- 3 species are endemics (no significant cultivation):
  - *N. africanum* Braun-Blanq Morocco
  - *N. floridanum* (Al-Shehbaz & Rollins)Al-Shehbaz & R.A. Price Florida USA
  - *N. gambellii* (S.Watson) O.E. Schulz California USA
- 2 species are widespread (native and naturalised) and cultivated:
  - *N. officinale* W. T. Aiton Two Row Watercress

    Native: North Africa, India, Pakistan, Central Asia, Middle East, Europe/Balkans.
    Naturalised: Africa, Asia, Australasia, North and South America
  - *N. microphyllum* Boenn. ex. Rchb. One Row Watercress

    Native: Morocco, Afghanistan, Iran, India, Pakistan, Central Asia, Middle and West Europe
    Naturalised: Yemen, Japan, Australasia, North America

    N. xsterile (Airy Shaw) Oefelein is a natural hybrid of *N. officinale* and *N. microphyllum*

    Used to produce the Watercress crop in Victorian Britain; produces occasional seeds

Identification of cultivated Nasturtium

Identification of the 2 cultivated Watercress species and their hybrid:

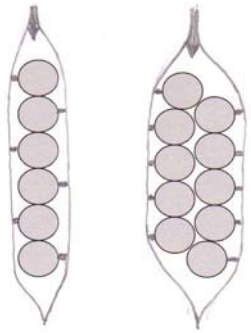
- Not possible on foliage alone, though *N. officinale* reported to stay green in winter, whereas *N. microphyllum* and the hybrid between them can turn brown in winter – not yet confirmed at SASA.

Main distinguishing characters:

1. Arrangement of seed in the siliqua
2. Length and width of siliqua and number of seeds
3. Degree of reticulation on the seed

Wild accessions of the two main cultivated *Nasturtium* species and their hybrid have been used as a reference for confirming the species of applications, and for defining suitable characteristics for classification of varieties.

Arrangement of seed in the siliqua



N. microphyllum	*N. officinale*
Uniseriate	Biseriate
Seeds in 1 row	Seeds in 2 rows

Pods of the two cultivated Nasturtium species and their natural hybrid

SASA accession no.	*SASA accession no.*	*SASA accession no.*
15109027	15110005	15109004

Seed reticulation

N. microphyllum *N. officinale*

Seed size: ca 1 to 1.5 mm

Nasturtium officinale





UK PBR applications: Watercress

- The first application made by a UK grower (John Hurd) in 2000, was seed-propagated *Nasturtium officinale*.
- Reference collection: small number of similar seed-propagated varieties (populations) from UK commercial growers.
- The candidate was darker green in colour and later to flower than other varieties, giving a significantly longer production period. (Commercial production stops at flowering due to the development of a bitter taste).
- NIAB undertook the tests in 2000 and 2001; UK PBR granted 2001.
- In 2008 a second application was submitted for UK PBR and subsequently to CPVO for EU PBR.
- Characteristics used for Distinctness were limited and needed revision; the reference collection was updated.
- The new candidate, tested at SASA, had reddish-purple foliage and was vegetatively-propagated. PBR granted 2010.

Creating a broader reference collection

- Commercial growers maintain a small number of varieties by repeated vegetative growth and harvest in watercress beds. Seed is harvested for long term maintenance at an isolated site (*Nasturtium* is open-pollinated):
  - John Hurd provided seed of 11 UK commercial populations of *Nasturtium officinale* with some information on distinguishing characters. Further commercial populations are being sourced.
- Much of the known variation is in wild flora and genebank accessions:
  - Wild populations representing *N. officinale*, *N. microphyllum* and *N. xsterile* were collected by a botanist from Royal Botanic Garden Edinburgh for reference.
  - 24 accessions of cultivated *Nasturtium* were obtained from the UK Vegetable genebank at Warwick University; the species which had not been identified, originated from a number of countries worldwide:

    Brazil, Denmark, France, Germany, Italy, Japan, Portugal, Spain (Tenerife and Menorca), The Netherlands, USA, and the UK.

Describing the wider variation to revise the DUS character set

- The range of variation in the broader collection was examined.
- Plants were grown as single plants in pots and as populations in trays.
- Visual observations were recorded on populations grown in trays - assessment is made on plants grown outdoors.
- Siliqua measurements and seed counts were made on populations.
- Leaf measurements were recorded on single plants with excised lateral and basal branches grown under glass (excision enhances the main stem growth and leaf size).
- 29 characteristics have been defined for DUS testing, 7 of which have been used for grouping and species classification.
- A UK DUS test protocol and a draft UPOV style technical guideline have been prepared.

Comparing Seed-propagated and Vegetatively-propagated Watercress varieties

Apical stem cuttings

- Taken from both seed-propagated and vegetatively-propagated plants at the same stage: top 5 nodes are cut, either from the main stem or from a branch, and transplanted into compost. Establishing cuttings is relatively easy as Watercress grows adventitious roots at each node.
- Provided plants do not flower, they are suitable for comparable recording; repeat cuttings can be taken from the original plants if required.
- Flowering in seed-propagated Watercress varieties is late in the year of sowing or in the year after sowing.
- Flowering in vegetatively-propagated Watercress varieties may be dependent on how long plants have been grown, and the effects of weather conditions, in their growing environment.

Comparing vegetatively-propagated Watercress varieties

Apical stem cuttings

- Comparison of vegetatively-propagated populations from different parts of the world can be problematic, as plants may have been influenced by different daylength and temperature.
- If the flowering process is initiated in some accessions, possibly caused by differences in vernalisation, the comparison of plants from apical stem cuttings is not possible.
- Once flower initiation has started, taking apical cuttings from branches, or from lower down the plant, does not significantly delay flowering.

Basal stem cuttings

- Basal stem cuttings (from branches at nodes 2-3) take longer to develop; these are used for growing comparable plants, as flower initiation appears to be delayed (plants grown outdoors).

Commercial Production

- *N. xsterile* (the hybrid) was historically grown in UK in 19th and 20th centuries ('poor mans lettuce') to produce watercress for the fresh market. It was maintained vegetatively and replanted each year to maintain quality.
- Today *N. officinale* is mainly used for commercial production.
- UK production is in watercress beds in very pure spring water at a constant temperature.
- Traditionally sold in hand-cut bunches (high end UK market), but is being replaced by machine-cut product.
- Mixed or pure varieties sold in packs (often washed) to supermarkets and restaurants; limited fresh market sales.
- Main production centres: Florida, UK, Spain, Portugal and Australia.

Watercress is grown in long beds in slowly moving spring water

Beds are emptied and cleaned each year

Varieties ready for mechanical harvest

Higher density for harvesting bunches by hand

Red and Green Watercress varieties

Commercial development

- Selection for late flowering to extend production period
- Selection for darker green or pigmented foliage
- High levels of PEITC (Phenyl isothiocyanate) associated with health giving properties - has stimulated the market.
- Further research on PEITC levels in different populations
- Expansion of markets has stimulated year round production

[End of Annex and of document]