



nak / tuinbouw

2011 International Spinach Conference
Amsterdam, 3 October 2011

Spinach variety testing at Naktuinbouw

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Spinach Variety Testing at Naktuinbouw



- Naktuinbouw
 - Variety Testing
 - Spinach Variety Testing
 - Resistance to Peronospora in Spinach
- Working Groups for race denominations
 - IWGP for spinach
 - IBEB for lettuce
- Concluding remarks



Naktuinbouw

- since 2000
 - Vegetable, Ornamental, Tree crops
 - predecessors NAK-G, NAK-S, NAK-B
 - Roelofarendsveen, near Amsterdam
 - Inspection, Laboratory, **Variety Testing**
 - Self-governed, not-for-profit, legal tasks as core
- Quality service of propagation materials
 - Seed health
 - Seed quality
 - **Variety Identity (DUS)**





Variety Testing

Identity of plant varieties

- for listing and protection by PBR
- European and national law
- Legal framework of UPOV
- D.U.S. (Distinct, Uniform, Stable)

Aims

- Listing: protection for growers
- PBR: protection for breeders



DUS Field Trial Methodology

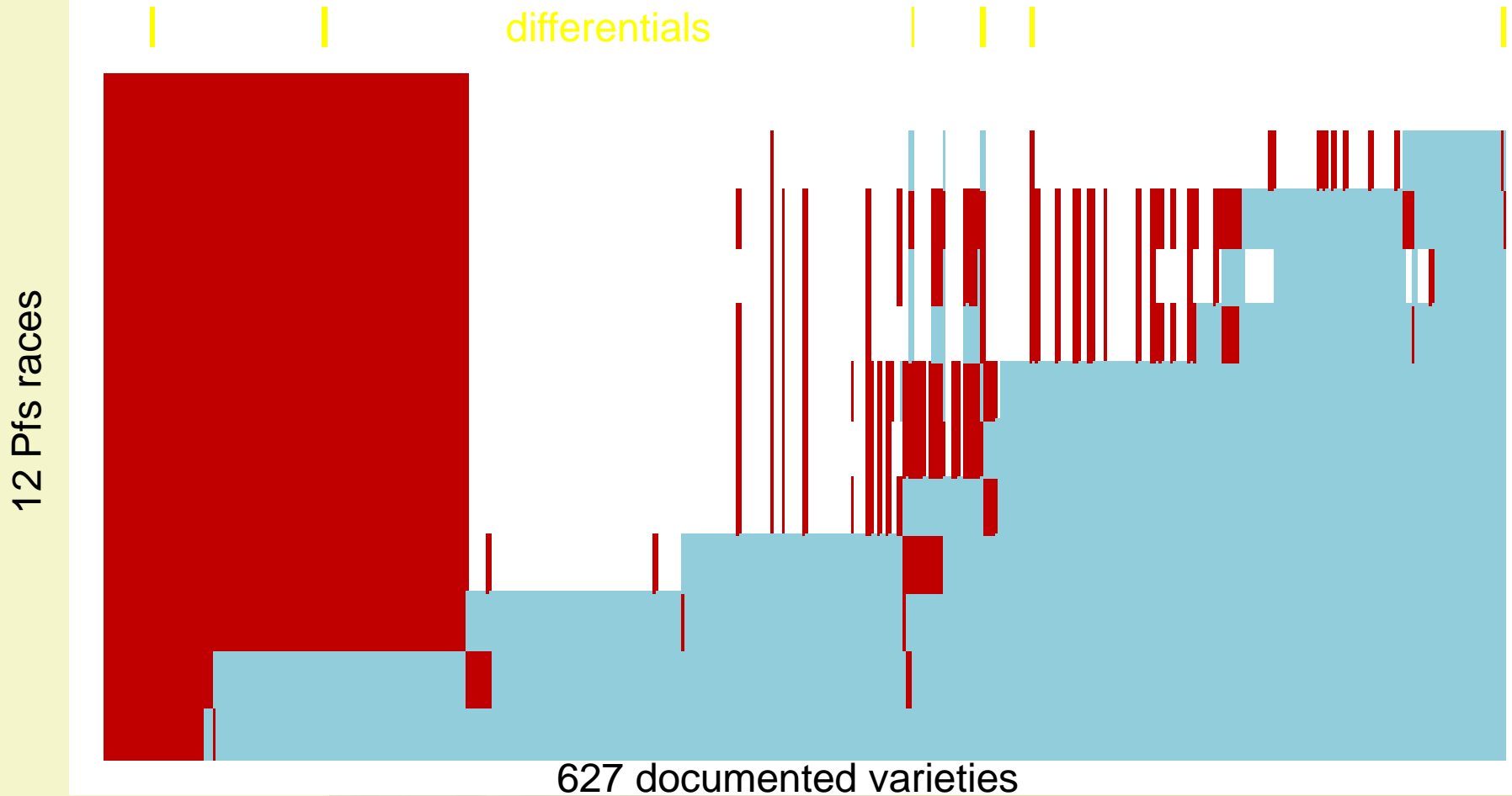
Identity sample (D, U)

- Alongside “best comparative” varieties
- 70 spaced plants (40 x 40 cm)
- until flowering and seed set

Standard seed (5 year cycle; U, S)

- Maintenance control
- Post-control
- Compare with identity sample

Search of comparing varieties



DUS Trial Reports



- **UPOV descriptions**
 - **CPVO – Community Plant Variety Office**
 - Following UPOV (and sometimes leading)
 - European PBR
 - European Common Catalogue
 - Same descriptions used for National List
- **Non-UPOV descriptions for PBR**
 - For example for USA
 - Measurements, means, standard deviations
 - Even more focus on distinctive characteristics



UPOV

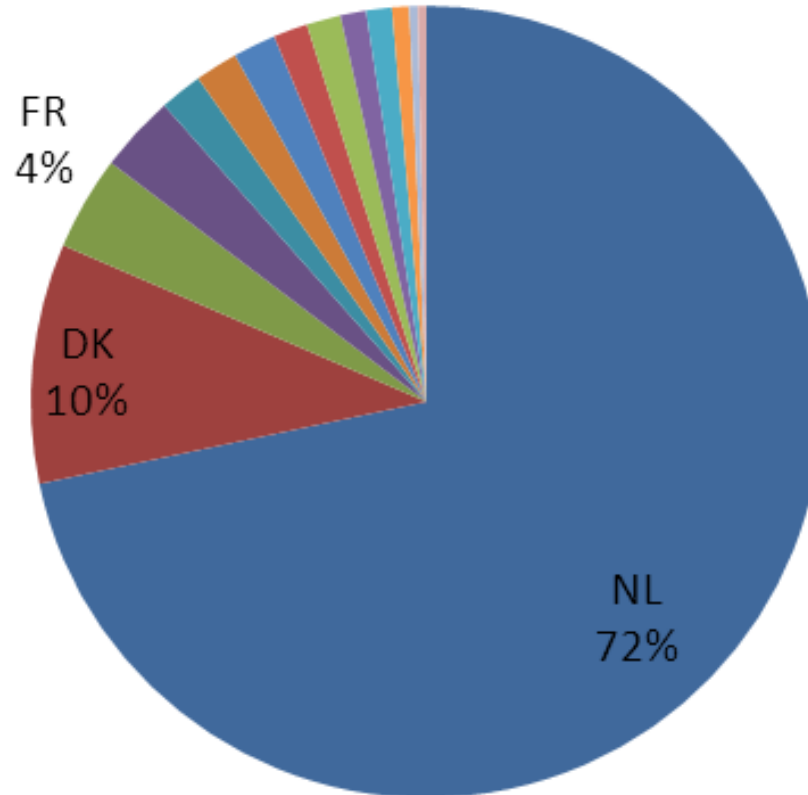
The UPOV logo is a green oval with a white border containing the letters 'UPOV' in a bold, green, sans-serif font.

To provide and promote
an effective system
of plant variety protection,
with the aim of encouraging
the development of new
varieties of plants,
for the benefit of society."

Spinach in EU Common Catalogue



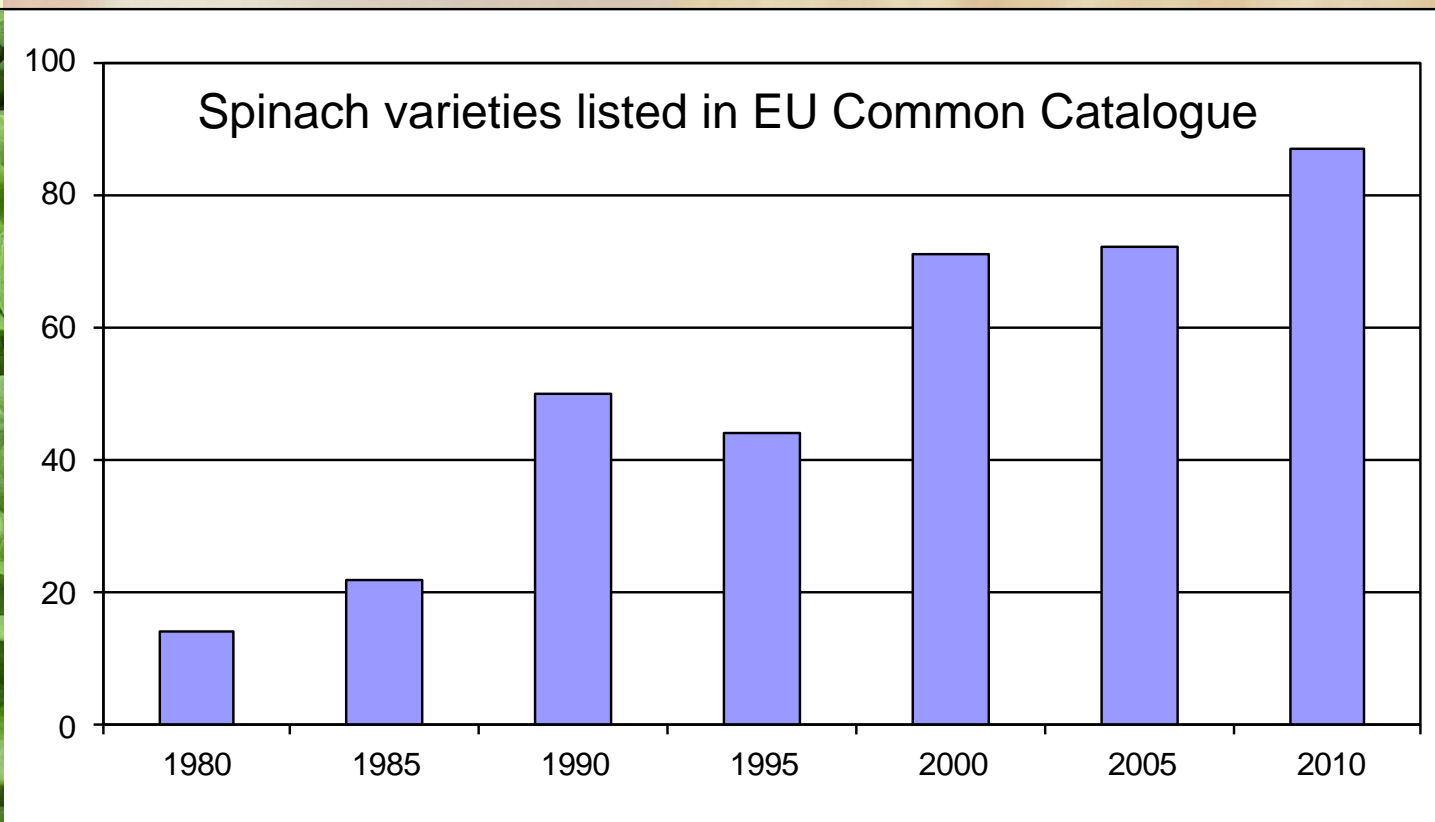
Total: 286 spinach varieties in Europe



205 spinach varieties (72%) listed by NL

NL	205
DK	28
FR	11
IT	9
CZ	5
ES	5
RO	5
DE	4
EL	4
HU	3
PL	3
BG	2
SK	1
UK	1

Naktuinbouw output 1976-2010



Spinach PBR in EU

Source: www.cpvo.europa.eu CPVO started its activity 1996

1 jan. - 1 jan.	EU Plant Breeders Right			
	'not yet'	granted	terminated	
1996 - 2000	0	10	2	12
2000 - 2005	0	22	9	31
2005 - 2010	2	22	0	24
2010 -	16	1	0	17
	18	55	11	84



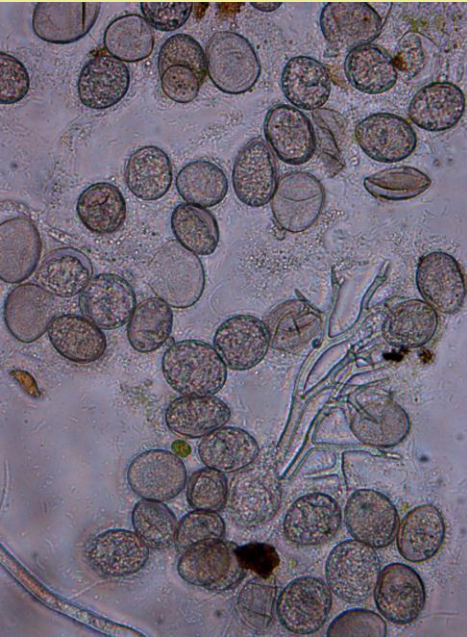
Resistance in Spinach DUS Testing

DISTINCT
UNIFORM
STABLE

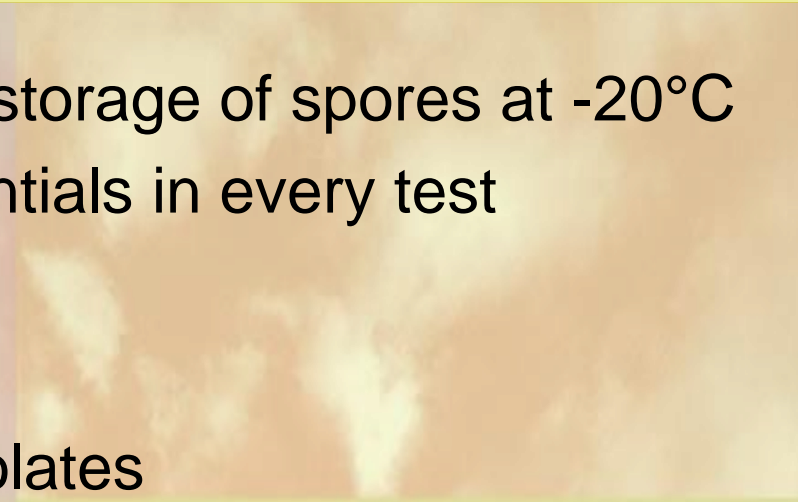
- **Grouping characteristics**
 - Obligatory Pfs: 5-7
 - Currently important Pfs: 8, 10-11
 - Historic interest only Pfs: 1-4, CMV
- **New isolates**
 - Race development Pfs: 12, 13
 - Breeding progress



Peronospora in Spinach



- Max 6-12 months storage of spores at -20°C
- Check with differentials in every test
- 13 isolates
- 8 differentials
- Monitoring new isolates

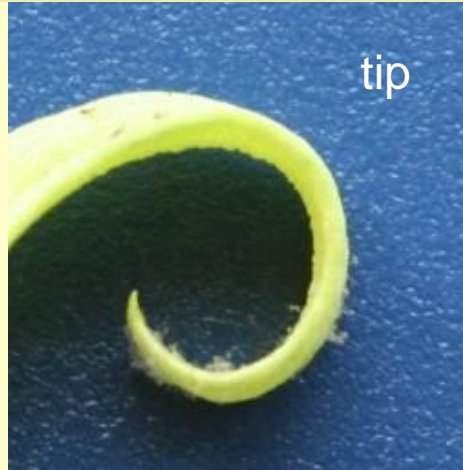


Test Methods Peronospora



- Spinach downy mildew test
 - Plant stage 1st leaf appearing
 - Humidity high - lower - high
 - Spore density 100.000 sp/ml
- Interpretation in two classes, but sometimes...
 - sporulation on cotyledon tips only
 - very light sporulation
 - field resistance

Light and heavy sporulation



It is difficult to see light sporulation



It is more difficult to know what it means

IWGP



- International Working Group
 - Peronospora in spinach
 - Since 2000-2005
 - At Plantum NL
- Participation:
 - 10 companies
 - Naktuinbouw
 - UARK
- Aim: Sharing data
 - Identify new and important isolates
 - Denomination if necessary
 - Publication by press release
 - Provide clear and reliable information to growers

Table on ISF website

www.worldseed.org

Feb 2011

July 2011

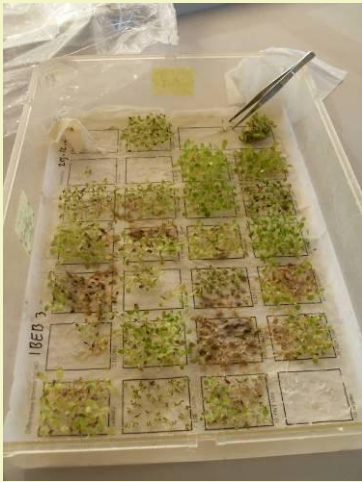
Pfs: 12

Pfs: 13

Table 1. Disease reactions of spinach differentials for determining the race identification of isolates of the spinach downy mildew pathogen, *Peronospora farinosa* f. sp. *spinaciae*.

Differential cultivar	Race of <i>Peronospora farinosa</i> f. sp. <i>spinaciae</i> *												
	1	2	3	4	5	6	7	8	9	10	11	2209	510C
Viroflay	+	+	+	+	+	+	+	+	+	+	+	+	+
Resistoflay	-	-	+	+	+	+	+	+	+	+	+	+	+
Califlay	-	+	-	+	-	+	+	-	-	+	-	-	+
Clermont	-	-	-	-	+	+	+	+	+	+	+	+	nt +
Campania	-	-	-	-	-	+	-	+	+	+	-	+	+/- +
Boeing (= Avenger in the USA) [#]	-	-	-	-	-	-	-	+	-	+	-	+	-
Lion	-	-	-	-	-	-	-	-	-	+	-	-	-
Lazio	-	-	-	-	-	-	-	-	-	-	+	+	+
Whale	-	-	-	(-)	-	(-)	(-)	-	-	+	-	+	nt +

Bremia lactucae



IBEB



- IBEB: International Bremia Evaluation Board
 - since 1999
 - 6-8 companies represented
 - also Naktuinbouw (NL) and GEVES (F)
- Isolate survey of breeders
 - 400-500 isolates per year in list
 - 24 differentials; BI: 17-27 denominated by IBEB
 - Sextet codes
 - Denomination based on objective criteria
 - 2 years, 3 locations
 - Publication by means of press release

IBEB Sextetcode for Pfs?

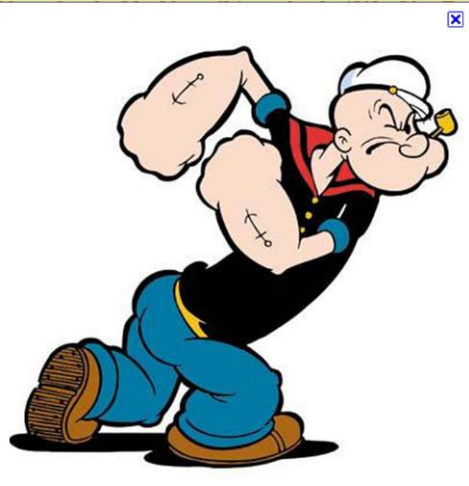
		Viroflay	Resistoflay	Califlay	Clermont	Campania	Boeing	Lion	Lazio	Whale		1st sextet	2nd sextet	Sextet code
Race	Type isolates													
Sextet value		0	1	2	4	8	16	32	1	2	4			
Pfs:1	zb61	+	-	-	-	-	-	-	-	-		0	0	00-00
Pfs:2	zb62	+	-	+	-	-	-	-	-	-		2	0	02-00
Pfs:3	zb63	+	+	-	-	-	-	-	-	-		1	0	01-00
Pfs:4	zb64	+	+	+	-	-	-	-	-	(-)		3	0	03-00
Pfs:5	zb65	+	+	-	+	-	-	-	-	-		5	0	05-00
Pfs:6	zb66	+	+	+	+	+	-	-	-	(-)		15	0	15-00
Pfs:7	zb67	+	+	+	+	-	-	-	-	(-)		7	0	07-00
Pfs:8	zb68	+	+	-	+	+	+	-	-	-		29	0	29-00
Pfs:9	not available	+	+	-	+	+	-	-	-	-		13	0	13-00
Pfs:10	zb69	+	+	+	+	+	+	+	-	+		63	2	63-02
Pfs:11	Se3208	+	+	-	+	-	-	-	+	-		5	1	05-01
Pfs:12	UA2209	+	+	-	+	+	+	-	+	-		29	1	29-01
Pfs:13	UA0510-C	+	+	+	+	+	-	-	+	+		15	3	15-03
nt222		+	+	+	-	-	+	+	-	(-)		51	0	51-00
nt223		+	+	+	-	-	+	+	-	+		51	2	51-02
nt230		+	+	-	+	+	+	-	+	-		29	1	29-01

IWGP learning from IBEB?



- Denomination !
 - Objective criteria (3 locations, 2 years)
 - Ringtest with candidate type isolates
 - No market communication before press release
- Dealing with complexity ?
 - Sextetcode
 - Phasing out of differentials and races
 - Define intermediate phenotypes
- Group size ??
 - IBEB 6 companies + 2 co-workers + 2 RA's
 - IWGP 10 companies + 1 RA + JC

Conclusions



- Breeding progress depends on efficient knowledge sharing about the increasing complexity of downy mildew disease

- This can be achieved by using the UPOV framework and the spirit of science



Quality in Horticulture

Naktuinbouw Calibration books

Calibration book

Spinacea oleracea L.

Spinach

*this is
an advertisement*

Useful for

- Company trials
- Technical questionnaires

Deliverable as

- hard copy booklet for € 80
- e-version for € 240