E

TWC/33/26 Add. 1 Rev.
ORIGINAL: English
DATE: July 13, 2015

INTERNATIONAL UNION FOR THE PROTECTION OF NEW VARIETIES OF PLANTS

Geneva

TECHNICAL WORKING PARTY ON AUTOMATION AND COMPUTER PROGRAMS

Thirty-Third Session
Natal, Brazil, June 30 to July 3, 2015

ADDENDUM TO

STATISTICAL METHODS FOR VISUALLY OBSERVED CHARACTERISTICS

Document prepared by the Office of the Union

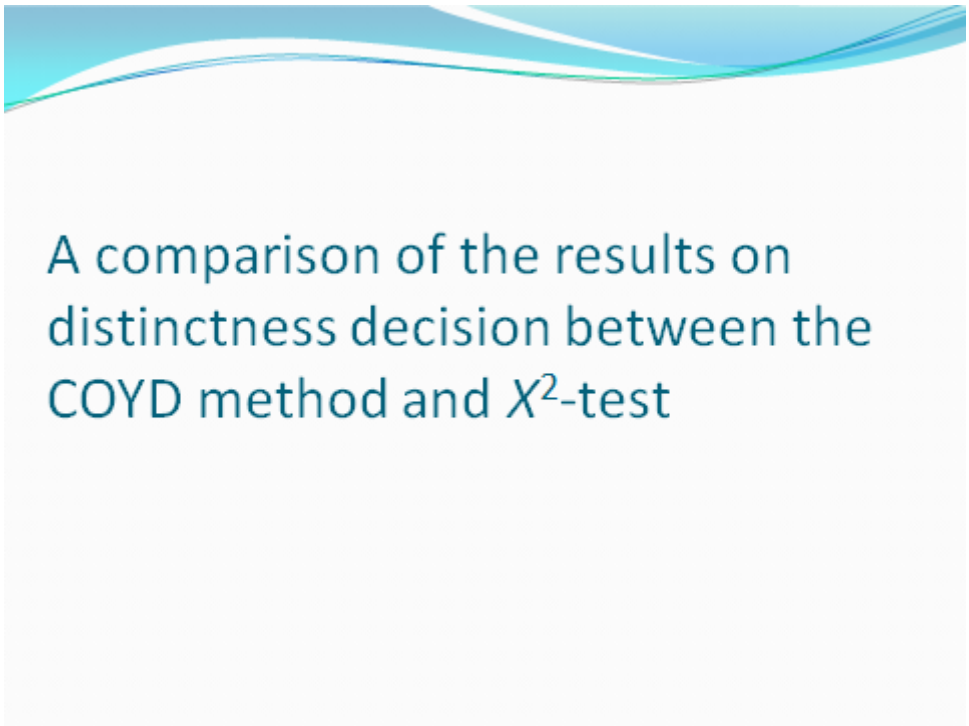
Disclaimer: this document does not represent UPOV policies or guidance

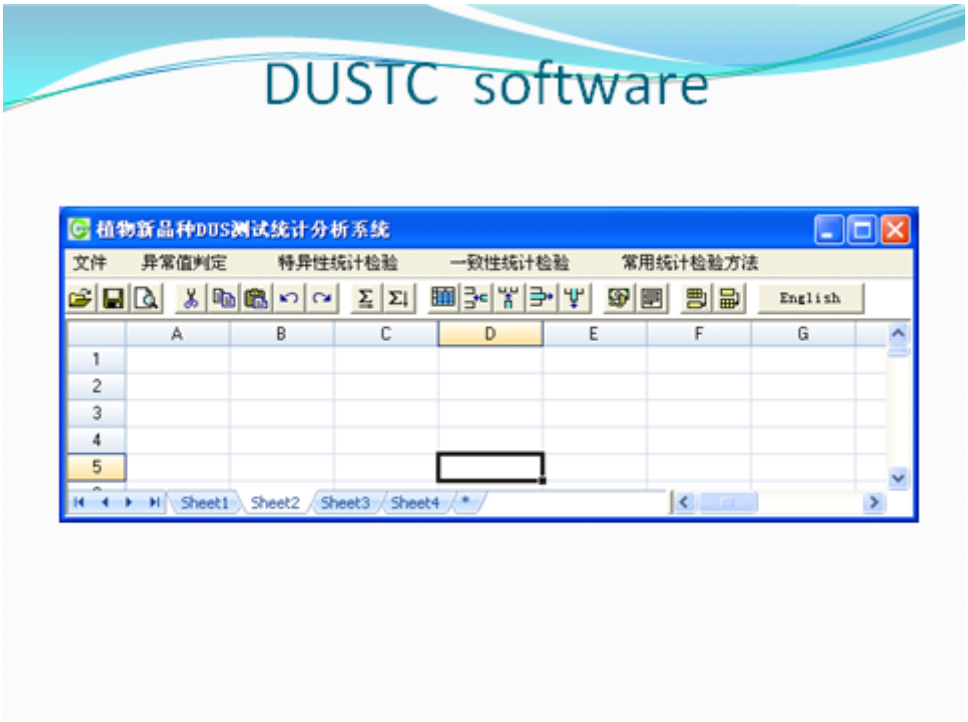
The Annex to this document contains a copy of a presentation that was made by an expert from China on "Analysis of visually observed characteristics using the DUST China (DUSTC) software package using the data set of meadow fescue provided by Finland" at the thirty-third session of the Technical Working Party on Automation and Computer Programs (TWC).

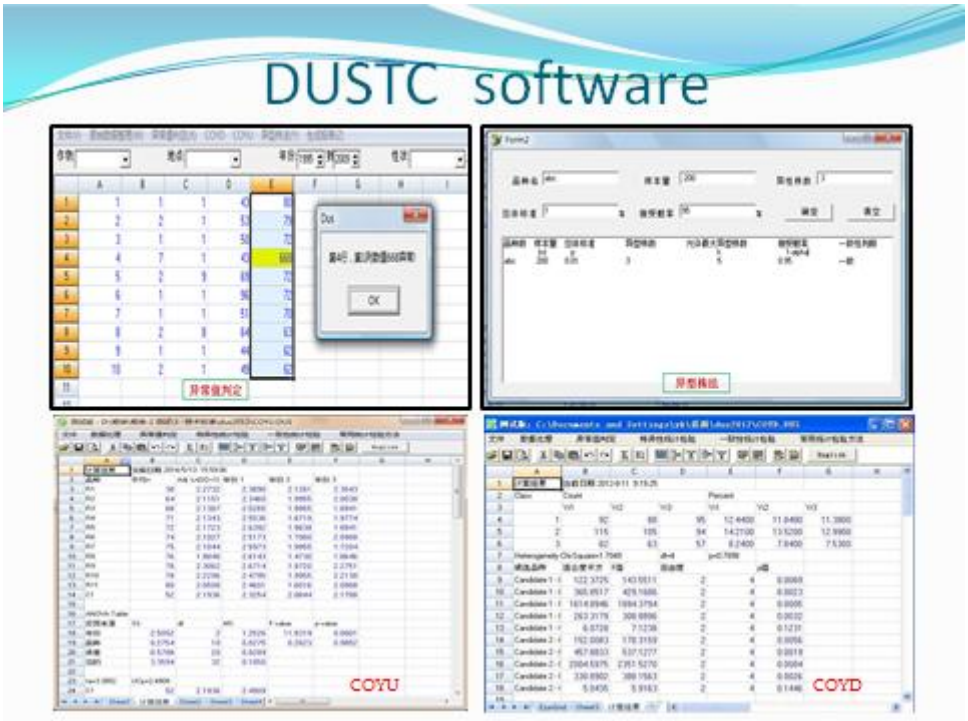
[Annex follows]

ANNEX


The analysis of visually observed characteristics using the DUST China (DUSTC) software package
— using the data set of meadow fescue provided by Finland
Expert from China
UPOV TWC
Thirty-third Session
Natal , Brazil, 29 June to 3 July, 2015


A comparison of the results on distinctness decision between the COYD method and X^2-test


DUSTC software
植物新品种DUS测试统计分析系统
文件
异常值判定
特异性统计检验
一致性统计检验
常用统计检验方法
English
Sheet1
Sheet2
Sheet3
Sheet4


DUSTC software
异常值判定
COYU
COYD

	erect-semi-erect	se cr
scale	2	
CANDIDATE A		
CANDIDATE B		
C		
D		
E	1	
F		
G		
H		
I		
J		
K		
L		
M		
N		
O		
P		
Q		
R		
S		
T		
U		
V		
W		
X		
Y	1	
Z		
1		
2		
3		
4		
5		

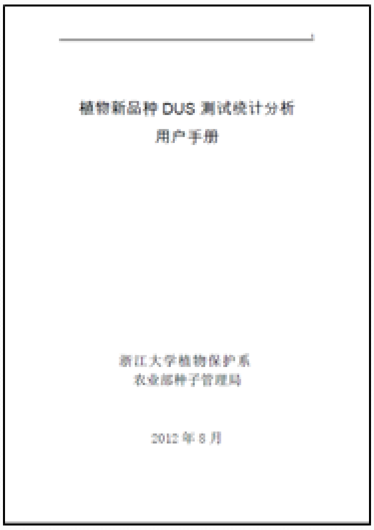
	erect-semi-erect
scale	2
CANDIDATE A	
CANDIDATE B	
C	4
D	6
E	9
F	1
G	3
H	6
I	2
J	
K	
L	3
M	1
N	2
O	5
P	9
Q	4
R	3
S	5
T	6
U	7
V	3
W	1
X	6
Y	4
Z	10
1	15
2	7
3	5
4	9
5	3

	erect	erect-semi-erect	semi-erect	semi-erect - intermediate	intermediate	intermediate - semi-prostrate
scale	1	2	3	4	5	6
CANDIDATE A	2	20	23	5	8	1
CANDIDATE B		20	21	11	5	
C		24	21	7	6	1
D	2	17	23	14	3	
E	1	22	28	6	1	
F		11	14	15	18	1
G		29	25	4	1	
H	5	28	21	4	1	
I	1	20	21	8	9	
J		15	27	12	6	
K		16	14	13	13	2
L	3	20	26	8	3	
M		18	22	13	6	
N		10	24	9	14	1
O		19	29	10	1	
P	2	23	32	3		
Q	1	24	24	8	2	
R		24	26	6	1	
S	1	16	27	11	4	
T		19	24	7	7	
U	2	17	31	8		
V	1	12	24	5	13	
W		14	17	15	13	
X	2	24	24	8	2	
Y		20	26	11	3	
Z	2	24	27	4		
1	3	32	18	5		1
2		22	30	6	2	
3	1	19	17	15	7	
4	1	17	28	9	2	
5		14	26	16	4	

Data set of meadow fescue (Plant: growth habit at inflorescence emergence) from year 2010 to 2012 provided by Finland.

DUSTC.exe
DUS测试软件使用说明.pdf

- User's manual
- Chinese version only



X^2-test, data analysis

Initial data (2012)	Scale	1	2	3	4	5	6
	CANDIDATE A	2	20	23	5	8	1
	F	0	11	14	15	18	1
Processed data (2012)	Scale	1-2		3	4	5-6	
	CANDIDATE A	22		23	5	9	
	F	11		14	15	19	

观察值	observed frequency				
2	20	23	5	8	1
0	11	14	15	18	1
理论值	expected frequency				
1	15.5	18.5	10	13	1
1	15.5	18.5	10	13	1
卡方值Chi=15.64825	df=5	p=0.00792			
有4个单元格的理论值小于5，占33.33%，最小值为1.00					
似然比卡方=16.8144	df=5	p=0.00487			
Williams校正G=15.0947	df=5	p=0.00997			
Pearson列联系数=0.3422					
Cramer系数=0.3642					
运行时间 0秒.					
FISHER精确检验, P =0.003780					

Analysis of Initial data

观察值			
22	23	5	9
11	14	15	19
理论值			
16.5	18.5	10	14
16.5	18.5	10	14
卡方值Chi=14.42728	df=3	p=0.00238	
似然比卡方=14.8331	df=3	p=0.00197	
Williams校正G=14.5077	df=3	p=0.00229	
Pearson列联系数=0.3301			
Cramer系数=0.3497			
各单元格理论值较大,不必用FISHER精确检验.			

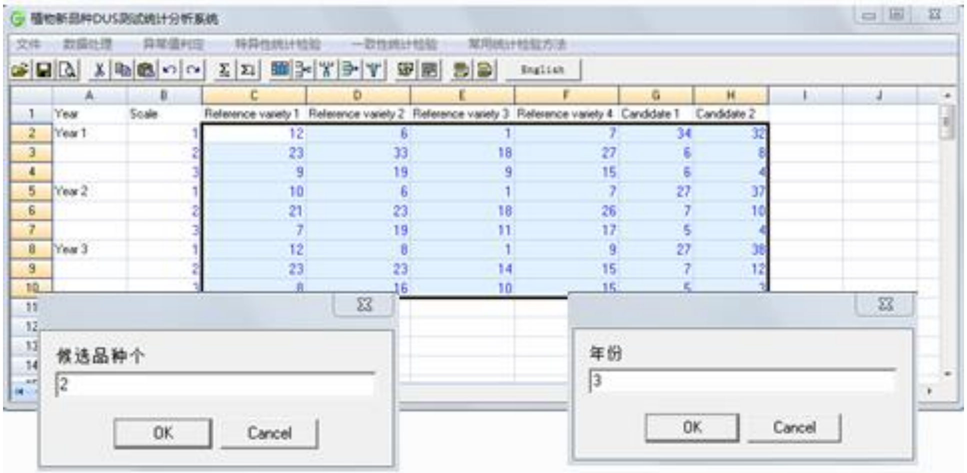
Analysis of processed data

X^2-test

- Chi-squared test, p-value 0.05, often;
- Continuity-corrected Chi-squared test, not usual;
- Fisher's exact test, depend;
- At least 2 out of 3 years data;
- Cochran criteria: the expected frequencies should be >1, and 20% of them should be >5, if not, combination of classes needed.

Ref. Variety		CANDIDATE A 2010	2011	2012	Distinct by Chi-square test		CANDIDATE B 2010	2011	2012	Distinct by Chi-square test
CANDIDATE 1	CANDIDATE A	-	-	-	no	CANDIDATE A	0.0153	0.4852	0.3149	no
CANDIDATE 2	CANDIDATE B	0.0153	0.4852	0.3149	no	CANDIDATE B	-	-	-	no
Antti	C	0.7722	0.1685	0.8587	no	C	0.0585	0.1304	0.8704	no
Arni	D	0.2815	0.0412	0.0580	no	D	0.0587	0.8248	0.8287	no
Belino	E	0.0006	0.0290	0.0881	D	E	0.0006	0.6562	0.1533	no
Boris	F	0.0115	0.0001	0.0024	D	F	0.7518	0.0006	0.0052	D
Cosmos	G	0.0211	0.7087	0.0452	no	G	0.0645	0.9140	0.0511	no
Dorimo	H	0.0000	0.0001	0.0380	D	H	0.0009	0.1940	0.0277	D
Furc	I	0.2731	0.8302	0.8479	no	I	0.3514	0.3873	0.8578	no
Ilmari	J	0.2989	0.1416	0.1833	no	J	0.0071	0.3344	0.8770	no
Inkeri	K	0.1484	0.0008	0.0424	D	K	0.4803	0.0085	0.0718	no
Jägum 47	L	0.1458	0.3950	0.2736	no	L	0.1650	0.7950	0.8888	no
Kaleva	M	0.1899	0.3721	0.2085	no	M	0.6617	0.0923	0.9800	no
Kasper	N	0.1205	0.0008	0.0871	no	N	0.0958	0.0093	0.0332	D
Laura	O	0.0155	0.0078	0.0298	D	O	0.0238	0.6290	0.2772	no
Lifum	P	0.0029	0.0001	0.0081	D	P	0.0007	0.1180	0.0050	D
Lifeline	Q	0.0280	0.8665	0.1473	no	Q	0.0305	0.8883	0.4972	no
Minor	R	0.2871	0.9774	0.0731	no	R	0.8609	0.9307	0.1775	no
Minna	S	0.0025	0.1802	0.1822	no	S	0.0438	0.2530	0.8022	no
Norild	T	0.2348	0.0007	0.8519	no	T	0.5131	0.3019	0.8944	no
Proud	U	0.0002	0.0084	0.0070	D	U	0.0003	0.6954	0.0592	no
Salten	V	0.3270	0.2650	0.3997	no	V	0.6987	0.3905	0.0587	no
Scon	W	0.1975	0.0533	0.0583	no	W	0.1904	0.1179	0.1318	no
Scou	X	0.0229	0.0128	0.1390	no	X	0.0080	0.7184	0.4887	no
Sigurd	Y	0.4949	0.3723	0.1374	no	Y	0.0882	0.8834	0.6248	no
Stella	Z	0.0138	0.0197	0.0138	D	Z	0.0035	0.8798	0.0178	D
SW Forward	1	0.0070	0.0000	0.0188	D	1	0.0249	0.0886	0.0284	D
SW Minto	2	0.4120	0.1497	0.1409	no	2	0.3706	0.5397	0.2404	no
SW Research	3	0.3662	0.2904	0.1003	no	3	0.0458	0.3897	0.7207	no
Tuomisto	4	0.1855	0.0138	0.0915	no	4	0.0338	0.8843	0.4747	no
Tyko	5	0.0687	0.2842	0.0315	D	5	0.7737	0.1781	0.4817	no

COYD, data analysis



COYD, data analysis

Class	Count			Percent		
	Yr1	Yr2	Yr3	Yr1	Yr2	Yr3
1	92	88	95	12.4400	11.84	11.38
2	115	105	94	14.2100	13.52	12.99
3	62	63	57	8.2400	7.84	7.53
Heterogeneity Chi-Square=1.7049			df=4	p=0.7898		
候选品种	适合度卡方	F 值	自由度		p 值	
Candidate1 - Reference variety 1	122.3725	143.55	2	4	0.0069	
Candidate1 - Reference variety 2	365.8517	429.17	2	4	0.0023	
Candidate1 - Reference variety 3	1614.8946	1894.38	2	4	0.0005	
Candidate1 - Reference variety 4	263.3179	308.89	2	4	0.0032	
Candidate 1 - Candidate 2	6.0728	7.12	2	4	0.1231	
Candidate2- Reference variety 1	152.0083	178.32	2	4	0.0056	
Candidate2 - Reference variety 2	457.8833	537.13	2	4	0.0019	
Candidate2-Reference variety 3	2004.5975	2351.53	2	4	0.0004	
Candidate2 - Reference variety 4	330.8902	388.16	2	4	0.0026	
Candidate 2 - Candidate 1	5.0435	5.92	2	4	0.1446	

COYD, data analysis

Part Ⅰ Two-Way Contingency Table

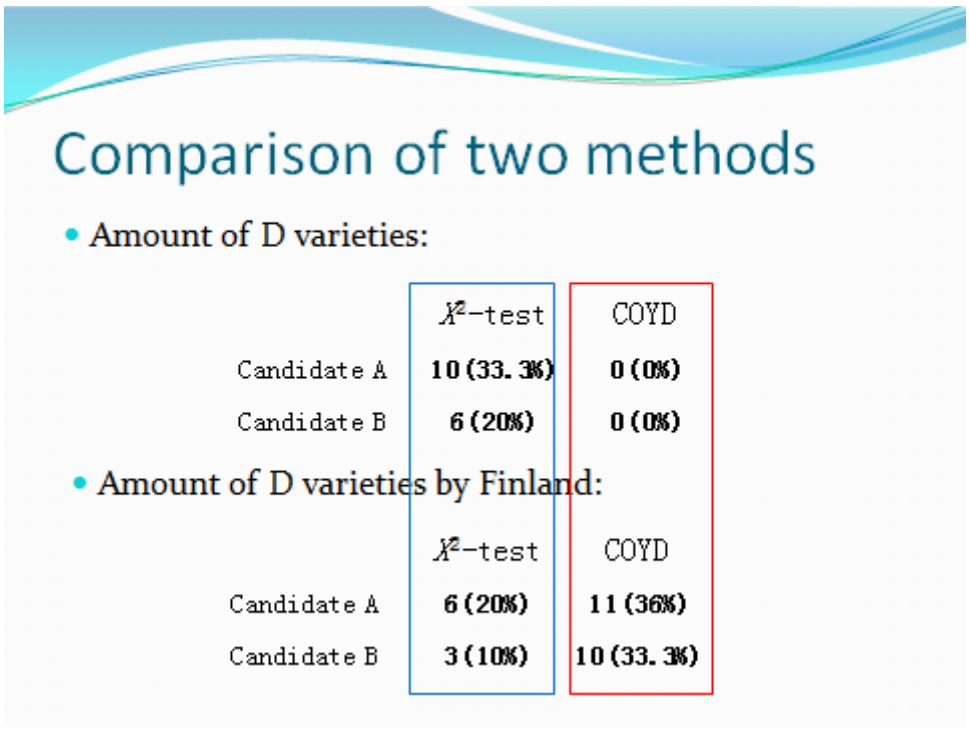
计算结果	当前日期 2015/3/9 14:28:06					
Class	Count			Percent		
	Yr1	Yr2	Yr3	Yr1	Yr2	Yr3
1	640	142	159	7.22	6.46	5.65
2	740	880	221	14.12	12.63	11.06
3	276	450	903	12.49	11.18	9.78
4	162	155	141	3.51	3.14	2.75
Heterogeneity Chi-Square=1266.5779			df=6	p=0.0000		

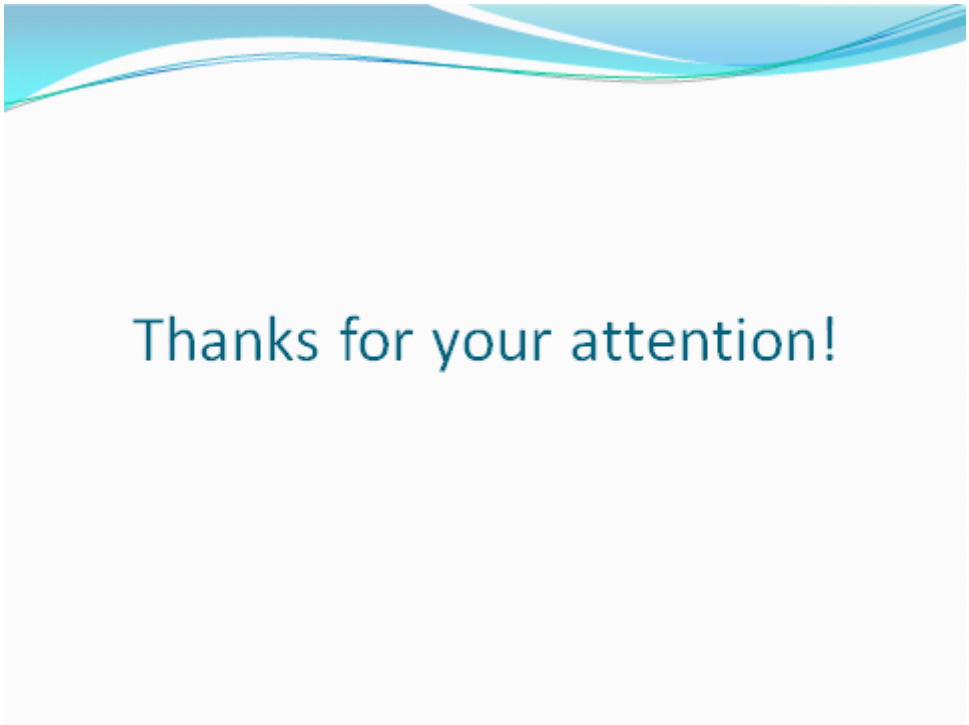
Part Ⅱ: Result of Distinctness Test

供试品种	[illegible]	F值	自由度		p值
CANDIDATE 1 - Antti	4.6535	0.0073	3	6	0.99594
CANDIDATE 1 - Arni	12.8149	0.0202	3	6	0.99529
CANDIDATE 1 - Belimo	102.9367	0.1625	3	6	0.91507
CANDIDATE 1 - Boris	53.5535	0.085	3	6	0.96364
CANDIDATE 1 - Cosmos	18.5369	0.0293	3	6	0.99193
CANDIDATE 1 - Darimo	149.4695	0.236	3	6	0.86876
CANDIDATE 1 - Fure	1.1572	0.0018	3	6	0.99987
CANDIDATE 1 - Ilmari	11.5201	0.0182	3	6	0.99597
CANDIDATE 1 - Inkeri	26.6549	0.0421	3	6	0.98839
CANDIDATE 1 - V10	7.4325	0.0117	3	6	0.99759
CANDIDATE 1 - Kalevi	2.6121	0.0041	3	6	0.99985
CANDIDATE 1 - Kasper	33.4963	0.0529	3	6	0.98115
CANDIDATE 1 - Laura	32.4035	0.0512	3	6	0.98204
CANDIDATE 1 - Lifara	131.5109	0.2077	3	6	0.8854
CANDIDATE 1 - Lifelix	7.0453	0.0111	3	6	0.99805
CANDIDATE 1 - Mimer	2.2149	0.0035	3	6	0.99985
CANDIDATE 1 - Minna	3.3614	0.0053	3	6	0.99935
CANDIDATE 1 - Norild	27.1605	0.0429	3	6	0.98802
CANDIDATE 1 - Preval+0.5	497.5451	0.7857	3	6	0.57624
CANDIDATE 1 - Salten	7.6527	0.0121	3	6	0.99779
CANDIDATE 1 - Sena	19.464	0.0307	3	6	0.99134
CANDIDATE 1 - Senu	40.8045	0.0644	3	6	0.97518
CANDIDATE 1 - Sigmund	2.6299	0.0042	3	6	0.99985
CANDIDATE 1 - Stella	206.4234	0.326	3	6	0.80909
CANDIDATE 1 - SW Forward	37.4259	0.0591	3	6	0.975
CANDIDATE 1 - SW Minto	2.1665	0.0035	3	6	0.99986
CANDIDATE 1 - SW Revansch	2.7665	0.0044	3	6	0.99981
CANDIDATE 1 - Tammisto	20.0436	0.0317	3	6	0.99096
CANDIDATE 1 - Tyko	9.1174	0.0144	3	6	0.99714
CANDIDATE 1 - CANDIDATE 2	0.3796	0.0006	3	6	0.99995

供试品种	[illegible]	F值	自由度		p值
CANDIDATE 2 - Antti	3.6455	0.0058	3	6	0.99927
CANDIDATE 2 - Arni	12.2261	0.0193	3	6	0.9956
CANDIDATE 2 - Belimo	96.0332	0.1516	3	6	0.92217
CANDIDATE 2 - Boris	42.9515	0.0679	3	6	0.97332
CANDIDATE 2 - Cosmos	14.9472	0.0236	3	6	0.9941
CANDIDATE 2 - Darimo	128.0626	0.2022	3	6	0.88592
CANDIDATE 2 - Fure	0.3067	0.0005	3	6	0.99995
CANDIDATE 2 - Ilmari	8.5257	0.0135	3	6	0.99741
CANDIDATE 2 - Inkeri	20.2694	0.032	3	6	0.99081
CANDIDATE 2 - V10	5.9597	0.0094	3	6	0.99545
CANDIDATE 2 - Kalevi	2.3305	0.0037	3	6	0.99962
CANDIDATE 2 - Kasper	24.4246	0.0386	3	6	0.98799
CANDIDATE 2 - Laura	26.1625	0.0413	3	6	0.98675
CANDIDATE 2 - Lifara	111.9973	0.1769	3	6	0.90569
CANDIDATE 2 - Lifelix	6.2064	0.0098	3	6	0.99535
CANDIDATE 2 - Mimer	2.2719	0.0036	3	6	0.99964
CANDIDATE 2 - Minna	2.0016	0.0032	3	6	0.9997
CANDIDATE 2 - Norild	16.8134	0.0265	3	6	0.99292
CANDIDATE 2 - Preval+0.5	229.5079	0.3624	3	6	0.78867
CANDIDATE 2 - Salten	4.2722	0.0067	3	6	0.99907
CANDIDATE 2 - Sena	14.4812	0.0229	3	6	0.99435
CANDIDATE 2 - Senu	37.6589	0.0595	3	6	0.97751
CANDIDATE 2 - Sigmund	3.1533	0.005	3	6	0.99941
CANDIDATE 2 - Stella	194.3509	0.3069	3	6	0.82103
CANDIDATE 2 - SW Forward	29.1977	0.0461	3	6	0.9845
CANDIDATE 2 - SW Minto	1.4905	0.0024	3	6	0.99951
CANDIDATE 2 - SW Revansch	3.7593	0.006	3	6	0.99922
CANDIDATE 2 - Tammisto	17.9465	0.0283	3	6	0.9923
CANDIDATE 2 - Tyko	7.571	0.012	3	6	0.99753
CANDIDATE 2 - CANDIDATE 1	0.3045	0.0005	3	6	0.99995

Ref. Variety	CANDIDATE 1				CANDIDATE 2			
	China		Finland		China		Finland	
	Distinct by χ2-test	Distinct by COYD	Distinct by χ2-test	Distinct by COYD	Distinct by χ2-test	Distinct by COYD	Distinct by χ2-test	Distinct by COYD
cand 1	no	no	no	no	no	no	no	no
cand 2	no	no	no	no	no	no	no	no
Antti	no	no	no	no	no	no	no	no
Arni	no	no	no	no	no	no	no	no
Belimo	D	no	no	D	no	no	no	D
Boris	D	no	D	D	D	no	D	D
Cosmos	no	no	no	no	no	no	no	no
Darimo	D	no	D	D	D	no	no	D
Fure	no	no	no	no	no	no	no	no
Ilmari	no	no	no	no	no	no	no	no
Inkeri	D	no	D	D	no	no	no	D
Jõgeva 47	no	no	no	no	no	no	no	no
Kalevi	no	no	no	no	no	no	no	no
Kasper	no	no	no	D	D	no	no	D
Laura	D	no	no	no	no	no	no	no
Lifara	D	no	D	D	D	no	D	D
Lifelix	no	no	no	no	no	no	no	no
Mimer	no	no	no	no	no	no	no	no
Minna	no	no	no	no	no	no	no	no
Norild	no	no	no	no	no	no	no	no
Preval	D	no	no	D	no	no	no	D
Salten	no	no	no	D	no	no	no	D
Sena	no	no	D	no	no	no	no	no
Senu	no	no	no	no	no	no	no	no
Sigmund	no	no	no	no	no	no	no	no
Stella	D	no	no	D	D	no	no	D
SW Forward	D	no	D	D	D	no	D	no
SW Minto	no	no	no	no	no	no	no	no
SW Revansch	no	no	no	D	no	no	no	D
Tammisto	no	no	no	no	no	no	no	no
Tyko	D	no	no	no	no	no	no	no





[End of Annex and of document]