

Technical Working Party for Agricultural Crops**TWA/53/7****Fifty-Third Session****Original:** English**Virtual meeting, May 27 to 30, 2024****Date:** May 15, 2024

DUS TESTS: ONE SITE IN TWO YEARS VERSUS TWO SITES IN ONE YEAR*Document prepared by an expert from Denmark**Disclaimer: this document does not represent UPOV policies or guidance*

The annex to this document contains a copy of a presentation “DUS tests: one site in two years versus two sites in one year”, to be made by an expert from Denmark, at the fifty-third session of the Technical Working Party for Agricultural Crops (TWA).

[Annex follows]

DUS tests: one site in two years *versus* two sites in one year

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Can we speed up the DUS test process?

- The duration of the DUS test has to be at least two **independent** growing cycles normally conducted at one place to be sufficient, consistent and clear
- DUS tests shall be done *“under conditions ensuring satisfactory growth for the expression of the relevant characteristics of the variety and for the conduct of the examination”* TGP/7
- Where two growing cycles are conducted in the same year and at the same time, a suitable distance or a suitable difference in growing conditions between two locations may satisfy the requirement for independence TGP/8


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Can we speed up the DUS test process?

- Two year at the same location vs one year in two locations
 - bread wheat (*Triticum aestivum* L. *emend.* Fiori et Paol. (T.a.)
 - durum wheat *Triticum turgidum* L. *subsp.* *durum* (Desf.) Husn (T.d.)
- Are there any non-distinct (ND) variety pairs in the two setup's *and if yes,*
- is it the same ND-pair in each system
- Issues regarding uniformity and stability was not tested



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Two DUS setup's

TystofteFonden 

Triticum aestivum L. *emend.* Fiori et Paol. (T.a.)

Triticum turgidum L. *subsp.* *durum* (Desf.) Husn (T.d.)



Maps provided by the author.
The boundaries and names shown on this map do not imply the expression of any opinion whatsoever on the part of UPOV concerning the legal status of any country, territory, city or area or of its authorities, or concerning the delimitation of its frontiers or boundaries.

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Two DUS setup's

T.a $S_1=DK21-DK22;$ $S_2=DK21-IT21$
242 varieties in common (all with PBR – within EU and Ukraine)
Protocol: CPVO/TP-003/5

T.d $S_1=IT21-IT22;$ $S_2=IT21-MA21$
Protocol: CPVO/TP-120/3
122 varieties in common (all with PBR – within EU)

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Distinctness

$$D(V_a - V_b)_{CnSm} = \frac{|V_a CnSm - V_b CnSm|}{\text{MinDist}(CnS) \text{ or } LSD_{0.99}(CnSm)}$$

$$\mathbf{MaksD} (V_a - V_b)_{Sm} = \text{Max}[D(V_a - V_b)_{C1Sm}, D(V_a - V_b)_{C2Sm}, \dots, D(V_a - V_b)_{CnSm}]$$

If $\mathbf{MaksD} (V_a - V_b)_{Sm} \geq 1.0$ **then the variety pair is distinct in system** S_m

$$\mathbf{SUMD} (V_a - V_b)_{Sm} = \sum [D(V_a - V_b)_{C1Sm}, D(V_a - V_b)_{C2Sm}, \dots, D(V_a - V_b)_{CnSm}] \dots$$

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Minimum distances

Growth stages and minimum distances of the assessments and measurements in *Triticum aestivum* L. emend. Fiori et Paol.

Growth stage	CPVO no	Characteristic	Scale	Min dist/ LSD	Growth stage	CPVO no	Characteristic	Scale	Min dist/ LSD	Growth stage	CPVO no	Characteristic	Scale	Min dist/ LSD	Growth stage	CPVO no	Characteristic	Scale	Min dist/ LSD
00	1	Seed: colour	1. white 2. reddish 3. purple 4. bluish	0,9	60-65	8	Flag leaf: glaucosity of sheath	1. absent or very weak 2. weak 3. medium 4. strong 5. very strong	1,5	80-92	15	Ear: density	1. very lax 2. lax 3. medium 4. dense 5. very dense	1,5	80-92	22	Lower glume: shoulder width	1. absent or very narrow 2. narrow 3. medium 4. broad 5. very broad	1,5
00	2	Seed: coloration with phenol	1. absent or very light 2. light 3. medium 4. dark 5. very dark	1,5	60-65	9	Flag leaf: glaucosity of blade	1. absent or very weak 2. weak 3. medium 4. strong 5. very strong	1,5	80-92	16	Ear: length (excluding awns), mean of 5 subsamples	mm	LSD	80-92	23	Lower glume: shoulder shape	1. strongly sloping 2. slightly sloping 3. horizontal 4. slightly elevated 5. strongly elevated	1,5
09-11	3	Coleoptile: anthocyanin coloration	1. absent or very weak 2. weak 3. medium 4. strong 5. very strong	2	60-69	10	Ear: glaucosity	1. absent or very weak 2. weak 3. medium 4. strong 5. very strong	1,5	80-92	17	Ear: scurs or awns	1. both absent 2. scurs present 3. awns present	1	80-92	24	Lower glume: length of beak	1. very short 2. short 3. medium 4. long 5. very long	1,5
25-29	4	Plant: growth habit	1. erect 2. semi erect 3. intermediate 4. semi prostrate 5. prostrate	1,5	60-69	11	Culm: glaucosity of neck	1. absent or very weak 2. weak 3. medium 4. strong 5. very strong	1,5	80-92	18	Ear: length of scurs or awns	1. very short 2. short 3. medium 4. long 5. very long	1,5	80-92	25	Lower glume: beak shape	1. straight 2. slightly curved 3. moderately curved 4. strongly curved 5. geniculate	1,5
47-51	5	Plant: freq. of plants with recurv. flag leaf.	1. absent or very low 2. low 3. medium 4. high 5. very high	1,5	69-92	12	Lower glume: hair on ext. surf.	1. absent 2. present	7,9	80-92	19	Ear: colour	1. white 2. coloured	1	80-92	26	Lower glume: area of hairiness on internal surface	1. very small 2. medium 3. very large	1,5
49-60	6	Flag leaf: anthocyanin coloration of auricles	1. absent or very weak 2. weak 3. medium 4. strong	1,5	75-92	13	Plant: length mean of 5 subsamples	cm	LSD	80-92	20	Ear: shape in profile	1. tapering 2. parallel-sided 3. slightly clavate 4. strongly clavate 5. fusiform	1,5	80-92	27	Seasonal type	1. winter type 2. aberrant type 3. spring type	not used
50-52	7	Time of ear emergence days after 1st of April	days after 1st april	LSD	80-92	14	Straw: pith in cross section	1. thin 2. medium 3. thick or filled	1,5	80-92	21	Apical rachis segment: area of hair. on conv. surf.	1. absent or very small 2. small 3. medium 4. large 5. very large	1,5					

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Minimum distances

Growth stages and minimum distances of the assessments and measurements in *Triticum turgidum* L. subsp. durum (Desf.) Husn.

Growth stage	CPVO no	Characteristic	Scale	Min dist/ LSD	Growth stage	CPVO no	Characteristic	Scale	Min dist/ LSD	Growth stage	CPVO no	Characteristic	Scale	Min dist/ LSD	Growth stage	CPVO no	Characteristic	Scale	Min dist/ LSD
00	1	Seed: coloration with phenol	1. absent or very light 2. light 3. medium 4. dark 5. very dark	1,5	55-65	8	Flag leaf: glaucosity of lower side of leaf blade	1. absent or very weak 2. weak 3. medium 4. strong 5. very strong	2	80-92	15	Lower glume: shape of shoulder	1. sloping 2. rounded 3. straight 4. elevated 5. elevated with a 2nd beak	1	90-92	22	Ear: length (excluding awns) mean of 15 subsamples	mm	LSD
09-11	2	Coleoptile: anthocyanin coloration	1. absent or very weak 2. weak 3. medium 4. strong 5. very strong	1,5	55-69	9	Culm: density of hairiness of uppermost node	1. absent or very weak 2. weak 3. medium 4. strong 5. very strong	2	80-92	16	Lower glume: width of shoulder	1. very narrow 2. narrow 3. medium 4. broad 5. very broad	1,5	90-92	23	Ear: coloration	1. white 2. slightly coloured 3. coloured	1
25-29	3	Plant: growth habit	1. erect 2. semi erect 3. intermediate 4. semi prostrate 5. prostrate	1,5	60-69	10	Culm: glaucosity of neck	1. absent or very weak 2. weak 3. medium 4. strong 5. very strong	1,5	80-92	17	Lower glume: length of beak	1. very short 2. short 3. medium 4. long 5. very long	1,5	90-92	24	Ear: density	3. lax 4. medium 5. dense	1,5
50-51	4	Frequency of plants with recurved flag leaves	1. absent or very low 2. low 3. medium 4. high 5. very high	2	60-70	11	Ear: glaucosity	1. absent or very weak 2. weak 3. medium 4. strong 5. very strong	1,5	80-92	18	Lower glume: curvature of beak	1. absent 2. weak 3. moderate 4. strong	1,5	90-92	25	Grain: length of brush hair	1. short 2. medium 3. long	1,5
50-51	5	Time of ear emergence, days after 1st March	days after 1st march	LSD	75-92	12	Plant: length, mean of 10 subsamples	cm	LSD	80-92	19	Lower glume: hairiness on external surface	1. absent 2. present	7,9	90-92	26	Grain: shape	1. slightly elongated 2. moderately elongated 3. strongly elongated	1,5
55-59	6	Flag leaf: anthocyanin coloration of auricles	1. absent or very weak 2. weak 3. medium 4. strong 5. very strong	1	75-92	13	Ear: length of awns at tip relative to length of ear	1. shorter 2. equal 3. longer	1	80-92	20	Straw: pith in cross section	1. thin 2. medium 3. thick	1	80-92	27	Plant: seasonal type	1. winter type 2. aberrant type 3. spring type	not used
55-65	7	Flag leaf: glaucosity of sheath	1. absent or very weak 2. weak 3. medium 4. strong 5. very strong	1,5	80-92	14	Lower glume: shape	1. ovaloid 2. medium oblong 3. narrow oblong	1,5	90-92	21	Awn: colour	1. white 2. light brown 3. medium purple 4. dark purple	2					

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LSD Values

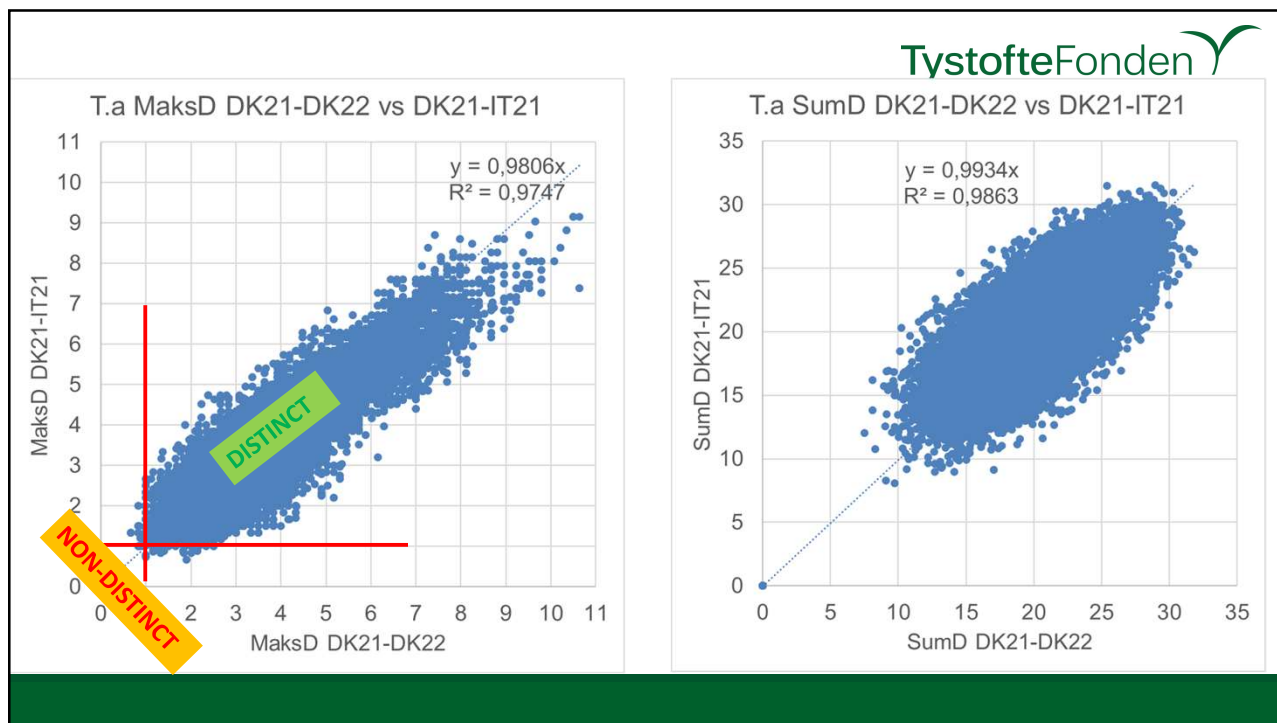
LSD values from CPVO 7, 13 and 16 in DK21-DK22 and DK21-IT21 in *Triticum aestivum* L. emend. Fiori et Paol.

Growth stage	CPVO no	Characteristic	Scale	LSD (0.99)	
				DK21-DK22	DK21-IT21
50-52	7	Time of ear emergence days after 1st of April	days after 1st april	1,8	2,3
75-92	13	Plant: length mean of 5 subsamples	cm	6,9	7,4
80-92	16	Ear: length (excluding awns), mean of 5 subsamples	mm	8,5	13,0

LSD values from CPVO 5, 12 and 22 in IT21-IT22 and IT21-MA21 in *Triticum turgidum* L. subsp. durum (Desf.) Husn

Growth stage	CPVO no	Characteristic	Scale	LSD (0.99)	
				IT21-IT22	IT21-MA21
50-51	5	Time of ear emergence, days after 1st March	days after 1st march	2,8	6,6
75-92	12	Plant: length, mean of 10 subsamples	cm	8,6	10,6
90-92	22	Ear: length (excluding awns) mean of 15 subsamples	mm	6,8	11,0

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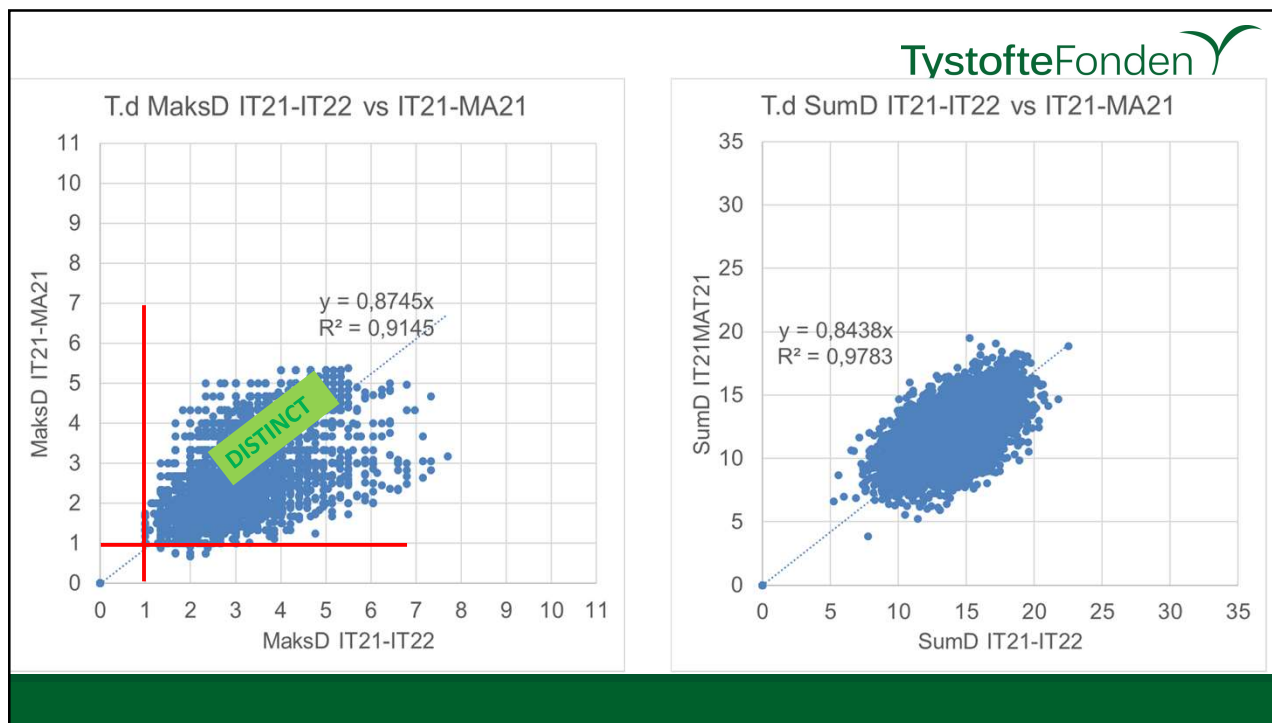


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T. a. Non distinct variety pairs in 2 systems

DK21-DK22				DK21-IT21			
VARIETY1	VARIETY2	MaxD_dk21-dk21	MaxD_dk21it21	VARIETY1	VARIETY2	MaxD_dk21-dk21	MaxD_dk21it21
GID-1006	GID-1282	1,0	2,0	GID-1006	GID-1129	1,8	0,9
GID-1009	GID-1267	0,8	1,5	GID-1007	GID-1038	2,0	0,8
GID-1012	GID-1040	0,7	1,3	GID-1007	GID-1044	1,0	0,8
GID-1024	GID-1304	1,0	1,2	GID-1020	GID-1042	1,8	0,9
GID-1026	GID-1035	0,8	1,3	GID-1022	GID-1040	1,2	0,9
GID-1029	GID-1048	0,9	1,2	GID-1029	GID-1184	1,3	0,8
GID-1035	GID-1284	0,8	1,5	GID-1033	GID-1042	1,8	0,8
GID-1036	GID-1038	0,8	1,0	GID-1035	GID-1040	1,4	0,9
GID-1040	GID-1171	0,8	1,5	GID-1038	GID-1044	1,2	0,9
GID-1049	GID-1257	0,7	1,3	GID-1040	GID-1174	1,2	1,0
GID-1079	GID-1257	0,8	2,0	GID-1079	GID-1267	1,3	0,8
GID-1171	GID-1267	0,9	1,0	GID-1102	GID-1118	1,9	0,7
GID-1191	GID-1241	0,8	1,3	GID-1174	GID-1267	2,1	0,9
				GID-1241	GID-1265	1,0	0,7

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Conclusions

- Pressure test
 - Very diverse agroclimatic test conditions
 - Sure on independency between trial sites
 - Several varieties out of “comfort-zone”
 - 242 T.a and 122 T.d varieties
- We found
 - 13/14 ND variety pairs in the **T.a** test setup’s *and*
 - 0/10 ND variety pairs in the **T.d** test setup’s
 - Not the same ND variety pairs in the two systems
 - Strong correlation in similarity between the two setup’s. Stronger in **T.a** compared with **T.d**.

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Recommendations

- Speed up DUS test is possible
 - Within same agroclimatic zone
 - Identical variety collections
 - Doubt on distinctness (ND in one environment and D in another), would lead to a 2nd year of DUS test

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