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**COMPARISON OF SOFTWARE FOR COYD***Document prepared by an expert from France**Disclaimer: this document does not represent UPOV policies or guidance*

The annex to this document contains a copy of a presentation “Comparison of software for COYD”, to be made by an expert from France, at the second session of the Technical Working Party on Testing Methods and Techniques (TWM).

[Annex follows]

# COMPARISON OF SOFTWARE FOR COYD

TWM/2 – April 8th to 11th



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## Background

✓ There was a first presentation at TWC/34.  
A ring test comparing 3 different software packages for COYD. The TWC noted that the same data set was used to compare results generated for the COYD procedure using the statistical packages developed in:


- China (DUSCEL)
- Germany (SAS system)
- United Kingdom (DUSTNT)

=> conclusion was the three different software packages produced same result

✓ TWC/37 validated new version of the software presented (DUSTNT). It recalled the previous exercise comparing results between the software of China and other software used by TWC participants:

So, it was proposed that further comparisons of software could be made for both COYD and COYU.

- China (DUSCEL)
- France (SAS system)
- United Kingdom (DUSTNT)



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## Ring test organization

- ✓ A ring test comparing three different software packages for COYD and COYU

COYU data comparison is not finished yet. There are still some results to check before giving a final conclusion

⇒ COYU analysis will be presented at the next session.

- ✓ Data set used for comparison.

TWC suggested three years COY tests should be carried out by participant, and the  $p=0.01$  for COYD.

The data set consists of raw data for 33 Tall Fescue varieties in each of three years. 9 of the varieties are candidates with the remainder to be treated as reference varieties. There are 11 characteristics and 20 data per variety in 3 replications .

- ✓ Statistical tools and participants.

- CN: China (DUSCEL)
- FR: France (SAS system)
- UK: United Kingdom (DUSTNT)



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## Calculated mean comparisons

UPOV n°12 Flag leaf: width (same flag leaf as that used for 13)

N° Variety	Varieties	UK	CN	F	Mean
105	Candidate A	5.79	5.79	5.86	5.8
108	Candidate B	5.00	5.00	5	5.0
121	Candidate C	5.29	5.29	5.31	5.3
122	Candidate D	5.45	5.45	5.49	5.5
123	Candidate E	4.98	4.98	5.06	5.0
124	Candidate F	5.73	5.73	5.71	5.7
125	Candidate G	5.23	5.23	5.22	5.2
126	Candidate H	5.93	5.93	5.88	5.9
127	Candidate I	5.74	5.74	5.59	5.7
100	Variety A	4.95	4.95	4.96	5.0
101	Variety B	5.83	5.83	6.08	5.9
102	Variety C	4.68	4.68	4.71	4.7
103	Variety D	4.67	4.67	4.71	4.7
104	Variety E	4.89	4.89	4.96	4.9
106	Variety F	5.08	5.08	5.12	5.1
107	Variety G	4.80	4.80	4.81	4.8
109	Variety H	5.11	5.11	5	5.1
110	Variety I	5.12	5.12	5.06	5.1
111	Variety J	5.33	5.33	5.38	5.3
112	Variety K	5.00	5.00	4.97	5.0
113	Variety L	5.41	5.41	5.35	5.4
114	Variety M	5.40	5.40	5.37	5.4
115	Variety N	5.76	5.76	5.73	5.8
116	Variety O	5.64	5.64	5.55	5.6
117	Variety P	4.92	4.92	5.01	4.9
118	Variety Q	5.52	5.52	5.55	5.5
119	Variety R	5.97	5.97	6.01	6.0
120	Variety S	5.39	5.39	5.37	5.4
128	Variety T	5.90	5.90	5.82	5.9
129	Variety U	5.64	5.64	5.54	5.6
130	Variety V	5.56	5.56	5.53	5.5
131	Variety W	6.00	5.99	5.98	6.0
132	Variety X	5.46	5.46	5.47	5.5
<b>Mean</b>		<b>5.4</b>	<b>5.4</b>	<b>5.4</b>	<b>5.4</b>

- ✓ Comparison mean between participants.

3 different types of correlation results:

- 1, difference of 1<sup>st</sup> number after point

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systèmes	UK	CN	F	Mean
UK	1	0.9999996	0.9824105	0.99809157
CN		1	0.98238348	0.98238348
F			1	0.99206657
Mean				1

3 Characteristics are in this case:

- UPOV 6: Plant tendency to form inflorescences (WV)
- UPOV 9: Plant growth habit at inflorescence emergence
- UPOV 12: Flag Leaf width

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## Calculated mean comparisons

UPOV n°8 Plant: time of inflorescence emergence (after vernalization)

N° Variety	Varieties	UK	CN	F	Mean
105	Candidate A	116.06	116.06	116.06	116.1
108	Candidate B	122.88	122.88	122.88	122.9
121	Candidate C	127.44	127.44	127.44	127.4
122	Candidate D	128.21	128.21	128.21	128.2
123	Candidate E	124.17	124.17	124.17	124.2
124	Candidate F	122.21	122.21	122.21	122.2
125	Candidate G	128.80	128.80	128.8	128.8
126	Candidate H	114.36	114.36	114.36	114.4
127	Candidate I	112.23	112.23	112.23	112.2
100	Variety A	125.02	125.01	125.01	125.0
101	Variety B	116.53	116.53	116.53	116.5
102	Variety C	123.08	123.08	123.08	123.1
103	Variety D	124.78	124.78	124.78	124.8
104	Variety E	119.44	119.44	119.44	119.4
106	Variety F	124.36	124.36	124.36	124.4
107	Variety G	123.25	123.25	123.25	123.2
109	Variety H	122.18	122.18	122.18	122.2
110	Variety I	128.01	128.01	128.01	128.0
111	Variety J	127.70	127.70	127.7	127.7
112	Variety K	128.58	128.58	128.58	128.6
113	Variety L	126.27	126.26	126.26	126.3
114	Variety M	127.32	127.32	127.32	127.3
115	Variety N	123.52	123.52	123.52	123.5
116	Variety O	120.81	120.81	120.81	120.8
117	Variety P	125.93	125.93	125.93	125.9
118	Variety Q	124.07	124.07	124.07	124.1
119	Variety R	117.02	117.02	117.02	117.0
120	Variety S	126.51	126.51	126.51	126.5
128	Variety T	121.02	121.02	121.02	121.0
129	Variety U	119.50	119.50	119.5	119.5
130	Variety V	120.66	120.66	120.66	120.7
131	Variety W	119.88	119.88	119.88	119.9
132	Variety X	126.18	126.18	126.18	126.2
<b>Mean</b>		<b>123.0</b>	<b>123.0</b>	<b>123.0</b>	<b>123.0</b>

✓ Comparison mean between participants.

- 2, difference of 2<sup>nd</sup> number after point

systèmes	UK	CN	F	Mean
UK	1	1	0.99999974	0.99999974
CN		1	0.99999974	0.99999974
F			1	0.99999889
Mean				1

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Most of characteristics are in this case:

- Nat 5: Plant length (at the end of growing period (BV)
- UPOV 7: Plant natural height after vernalization
- UPOV 8: Plant time of inflorescence emergence
- UPOV 10: Plant natural height at inflorescence emergence
- UPOV 11: Stem length of longest stem including inflorescence
- UPOV 13: Inflorescence length

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## Calculated mean comparisons

UPOV n°14 Flag leaf: length on representative stem (as for 11)

N° Variety	Varieties	UK	CN	F	Mean
105	Candidate A	159.44	159.44	159.44	159.4
108	Candidate B	109.64	109.64	109.64	109.6
121	Candidate C	190.19	190.19	190.19	190.2
122	Candidate D	167.78	167.78	167.78	167.8
123	Candidate E	157.77	157.77	157.77	157.8
124	Candidate F	151.56	151.56	151.56	151.6
125	Candidate G	152.91	152.91	152.91	152.9
126	Candidate H	171.47	171.47	171.47	171.5
127	Candidate I	170.90	170.90	170.9	170.9
100	Variety A	103.89	103.89	103.89	103.9
101	Variety B	153.99	153.99	153.99	154.0
102	Variety C	104.56	104.56	104.56	104.6
103	Variety D	101.00	101.00	101	101.0
104	Variety E	117.81	117.81	117.81	117.8
106	Variety F	108.23	108.23	108.23	108.2
107	Variety G	105.18	105.18	105.18	105.2
109	Variety H	109.69	109.69	109.69	109.7
110	Variety I	158.23	158.22	158.22	158.2
111	Variety J	164.35	164.35	164.35	164.4
112	Variety K	159.03	159.03	159.03	159.0
113	Variety L	163.58	163.58	163.58	163.6
114	Variety M	163.55	163.55	163.55	163.5
115	Variety N	175.02	175.02	175.02	175.0
116	Variety O	168.66	168.66	168.66	168.7
117	Variety P	171.76	171.76	171.76	171.8
118	Variety Q	168.85	168.85	168.85	168.9
119	Variety R	255.03	255.03	255.03	255.0
120	Variety S	164.16	164.16	164.16	164.2
128	Variety T	165.57	165.57	165.57	165.6
129	Variety U	162.64	162.64	162.64	162.6
130	Variety V	180.75	180.75	180.75	180.8
131	Variety W	157.57	157.57	157.57	157.6
132	Variety X	151.62	151.61	151.61	151.6
<b>Mean</b>		<b>153.5</b>	<b>153.5</b>	<b>153.5</b>	<b>153.5</b>

✓ Comparison mean between participants.

- 3, difference of 3<sup>rd</sup> number after point

systèmes	UK	CN	F	Mean
UK	1	1	1	1
CN		1	1	1
F			1	1
Mean				1

3

2 characteristics are in this case:

- Nat 0: Stem length of upper internode
- UPOV 14: Flag Leaf length on representative stem

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## Calculated mean comparisons

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systemes	UK	CN	F	Mean
UK	1	0.9999996	0.9824105	0.99809157
CN		1	0.98238348	0.98238348
F			1	0.99206657
Mean				1

2

systemes	UK	CN	F	Mean
UK	1	1	0.99999974	0.99999997
CN		1	0.99999974	0.99999974
F			1	0.99999989
Mean				1


3

systemes	UK	CN	F	Mean
UK	1	1	1	1
CN		1	1	1
F			1	1
Mean				1

✓ Comparison mean between participants.

- The correlation aren't all exactly the same at the point in function of the characteristics. This is the consequence of rounding in the calculations.

=> We can nevertheless say that it's equal... All is good



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## Calculated LSD comparisons

		UPOV 6	nat 5	UPOV 7	UPOV 8	UPOV 10	UPOV 9	UPOV 12	UPOV 14	UPOV 11	nat 0	UPOV 13
		CA801	CA982	CA809	CA910	CA880	CA811	CA817	CA819	CA813	CA870	CA844
p=0.01	LSD UK	1.48	3.48	4.04	3.42	7.85	0.46	0.72	23.94	9.50	53.03	21.80
	LSD CN	1.53	3.58	4.16	3.53	8.09	0.47	0.75	24.67	9.79	54.65	22.47
	LSD F	1.05	3.58	4.16	3.53	8.09	0.44	0.61	24.67	9.79	54.65	21.21

✓ Especially on characteristic UPOV6 There is difference between LSD in France.

✓ In the other characteristics the differences between participants aren't significant.



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## Final decisions comparisons

	105-CA			106-CA			121-CA			122-CA			123-CA			124-CA			125-CA			126-CA			127-CA		
	UK	OV	F	UK	OV	F	UK	OV	F	UK	OV	F	UK	OV	F	UK	OV	F	UK	OV	F	UK	OV	F	UK	OV	F
105 Candidate A	-	-	-	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D
106 Candidate B	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D
121 Candidate C	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D
122 Candidate D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D
123 Candidate E	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D
124 Candidate F	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D
125 Candidate G	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D
126 Candidate H	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D
127 Candidate I	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D
100 Variety A	D	D	D	ND	ND	ND	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D
101 Variety B	ND	ND	ND	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D
102 Variety C	D	D	D	ND	ND	ND	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D
103 Variety D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D
104 Variety E	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D
105 Variety F	D	D	D	ND	ND	ND	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D
107 Variety G	D	D	D	ND	ND	ND	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D
108 Variety H	D	D	D	ND	ND	ND	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D
110 Variety J	D	D	D	D	D	D	D	D	D	ND	ND	ND	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D
111 Variety I	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D
112 Variety K	D	D	D	D	D	D	D	D	D	ND	ND	ND	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D
113 Variety L	D	D	D	D	D	D	D	D	D	ND	ND	ND	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D
114 Variety M	D	D	D	D	D	D	D	D	D	D	D	D	ND	ND	ND	D	D	D	D	D	D	D	D	D	D	D	D
115 Variety N	D	D	D	D	D	D	D	D	D	D	D	D	D	D	ND	ND	ND	D	D	D	D	D	D	D	D	D	D
116 Variety O	D	D	D	D	D	D	D	D	D	D	D	D	D	D	ND	ND	ND	D	D	D	D	D	D	D	D	D	D
117 Variety P	D	D	D	D	D	D	D	D	D	D	D	D	D	D	ND	ND	ND	D	D	D	D	D	D	D	D	D	D
118 Variety Q	D	D	D	D	D	D	D	D	D	ND	ND	ND	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D
119 Variety R	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D
120 Variety S	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D
128 Variety T	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D
129 Variety U	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	ND	ND	ND	D	D	D	D	D	D	D
130 Variety V	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D
131 Variety W	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	ND	ND	ND	D	D	D	D	D	D	D
132 Variety X	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D

- ✓ Finally for all comparisons between varieties, only one decision case is different from the other participant:
- Candidate 122 is significantly different from VarietyL (Probably because the difference in one characteristic is at the limit of probability)
- Despite the previous case, the final decision stay similar in all situations for all candidates



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## Conclusions and follow-up

### Conclusion

✓ COYD:

The different softwares tested give us similar results and decisions

### Follow-up

✓ COYD:

Explore the light differences observed previously

✓ COYU:

The different softwares have been tested with mobile average method. The analysis and synthesis of final data are to be finalized.

we plan to present these results during the next session at the TWM/3



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Thank you to all participants and contributors

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**Thank you all for your  
attention**

