UPOV
International Union for the Protection of New Varieties of Plants

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COMPARISON OF SOFTWARE FOR COYD, U

Document prepared by an expert from France

Disclaimer: this document does not represent UPOV policies or guidance

The annex to this document contains a presentation “Comparison of software for COYD, U”, to be made by an expert from France, at the fourth session of the TWM.

[Annex follows]

ANNEX

GEVES
Expertise & Performance
Groupe d'Étude et de contrôle des Variétés Et des Semences

Comparison of software for COYD, U

Follow-up from TWM/2

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TWM/4 Cambridge, June 2026

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Background

- TWC/37 Proposed further comparisons of software for COYD and U_m (moving average)
  - China (DUSCEL)
  - France (SAS system)
  - United Kingdom (DUSTNT)
- TWM/2 First presentation about COYD comparisons:

  Conclusions: different software tested give us similar results* and decisions
  - Check results with new R system from France
  - *: Explore the light differences observed on one case in distinctness
- TWM/4 Follow-up COYD,Um comparisons:
  - Check results with new R system from France
  - Check COYUm results

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Ring test organization

- **A ring test comparing 3 (4) different software packages (TGP/8)**
- Statistical tools and participants:
  - China (DUSCEL)
  - France (SAS system and R-System)
  - United Kingdom (DUSTNT)
- Data set used for comparison:
  - 3 cycles COY tests should be carried out by participants, at p=0.01 for COYD
  - Data set of raw data on 33 Tall Fescue in 3 cycles, each
  - 9 of the varieties are declared as candidates with the remainder to be treated as reference varieties
  - There are 11 characteristics and 20 data per variety in 3 replications

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(COYD) Comparison with France R data -Average

- Calculated average comparisons

	UK	CN	F	Mean
UK	-	0.81389547	0.73369222	0.90075361
CN		-	0.98238348	0.98238348
F			-	0.95444724
Mean				-

	UK	CN	F	F-r	Mean
UK	-	0.81389547	0.73369222	0.81426536	0.88110227
CN		-	0.98238348	0.9999706	0.98238348
F			-	0.98246512	0.96468729
F-r				-	0.99111508
Mean					-

Worst correlation presented at the TWM/2 session => better correlation with new calculation system

- Conclusion given at the TWM/2 session is confirmed:
Good average calculations and results between participants

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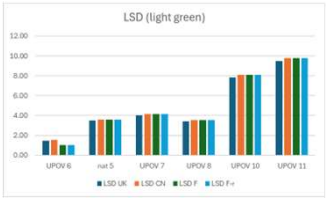
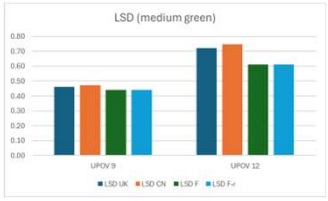
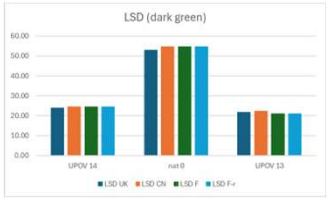
(COYD) Comparison with France R data -LSD

- Calculated LSD comparisons
  - Especially on characteristic UPOV n°6 – Plant: tendency to form inflorescences (WV): there is a difference with LSD in France
  - In the other characteristics, differences between participants are not significant

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







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Comparison with our data (GEVES)

	105-CA				108-CA				121-CA				122-CA				123-CA				124-CA				125-CA				126-CA				127-CA			
	UK	CN	F	F-r	UK	CN	F	F-r	UK	CN	F	F-r	UK	CN	F	F-r	UK	CN	F	F-r	UK	CN	F	F-r	UK	CN	F	F-r	UK	CN	F	F-r	UK	CN	F	F-r
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	D	D	D	D	D	D	D	D
108 Candidate B	D	D	D	9D	-	-	-	-	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
121 Candidate C	D	D	D	4D	D	D	D	D	-	-	-	-	ND	ND	ND	ND	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	3D	D	D	D	D	ND	ND	ND	ND	-	-	-	-	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	6D	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
124 Candidate F	D	D	D	2D	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
125 Candidate G	D	D	D	6D	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
126 Candidate H	D	D	D	2D	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
127 Candidate I	D	D	D	2D	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	-	-	-	-
100 Variety A	D	D	D	9D	ND	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	D	D	D	D
101 Variety B	ND	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	D	D	D	D	D	D	D	D
102 Variety C	D	D	D	9D	ND	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	D	D	D	D
103 Variety D	D	D	D	9D	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	D	D	D	D
104 Variety E	D	D	D	8D	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	D	D	D	D
106 Variety F	D	D	D	10D	ND	ND	ND	1D	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
107 Variety G	D	D	D	9D	ND	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	D	D	D	D
109 Variety H	D	D	D	9D	ND	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	D	D	D	D
110 Variety I	D	D	D	3D	D	D	D	D	D	D	D	D	ND	ND	ND	ND	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D
111 Variety J	D	D	D	4D	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	D	D	D	D
112 Variety K	D	D	D	4D	D	D	D	D	D	D	D	D	ND	ND	ND	ND	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D
113 Variety L	D	D	D	3D	D	D	D	D	D	D	D	D	ND	ND	1D	ND	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D
114 Variety M	D	D	D	4D	D	D	D	D	D	D	D	D	D	D	D	D	ND	ND	?	1D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D
115 Variety N	D	D	D	5D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	ND	ND	ND	ND	D	D	D	D	D	D	D	D	D	D	D	D
116 Variety O	D	D	D	1D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	ND	ND	ND	ND	D	D	D	D	D	D	D	D	D	D	D	D
117 Variety P	D	D	D	6D	D	D	D	D	D	D	D	D	D	D	D	D	ND	ND	ND	ND	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D
118 Variety Q	D	D	D	2D	D	D	D	D	ND	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
119 Variety R	D	D	D	5D	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	D	D	D	D
120 Variety S	D	D	D	3D	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	D	D	D	D
128 Variety T	D	D	D	3D	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	D	D	D	D
129 Variety U	D	D	D	2D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	ND	ND	ND	ND	D	D	D	D	D	D	D	D	D	D	D	D
130 Variety V	D	D	D	2D	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	D	D	D	D
131 Variety W	D	D	D	3D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	ND	ND	ND	ND	D	D	D	D	D	D	D	D	D	D	D	D
132 Variety X	D	D	D	4D	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	D	D	D	D

- New cases with different results in France with new R-system:
  - Candidate 108 significantly different from Variety F*
  - Candidate 123 significantly different from Variety M*

} Difference in single characteristic at the limit of probability (2nd number after decimal point)

- Despite these cases: **FINAL DECISIONS STAY SIMILAR is confirmed**

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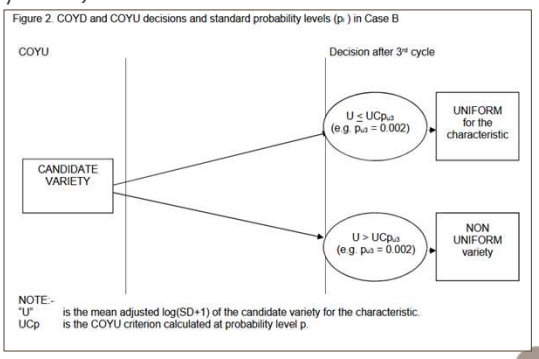
Comparison of software in COYU

- COYU analysis
  - Guidance to assess Uniformity by COYU is done on document TGP/8 chap.9

- Uniformity criterion:
  - Adjusted logSD (candidate) = U_c (candidate uniformity value)
  - Rejection Threshold (3 cycles) at p=0.01 = $UC_{p0.001}$
  - rejection threshold (3 years) p= 0.001



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Comparison of software in COYU

- Calculated averages
  - Presented for COYD => In all characteristics, differences between participants are not significant
- Calculated adjusted logSD (U_c):
  - Example with 2 characteristics: UPOV n°8 – Plant: time of inflorescence emergence (AV)

	UPOV n°8 Plant: time of inflorescence emergence (after vernalization)				
N° Variety	**Varieties**	**UK**	**CN**	**F**	**Mean**
105	Candidate A	1.43	1.43	1.5	1.45
108	Candidate B	1.67	1.68	1.66	1.7
121	Candidate C	1.64	1.60	1.6	1.6
122	Candidate D	1.68	1.63	1.68	1.7
123	Candidate E	1.59	1.63	1.59	1.6
124	Candidate F	1.71	1.75	1.69	1.7
125	Candidate G	1.54	1.46	1.49	1.5
126	Candidate H	2.11	1.93	1.99	2.0
127	Candidate I	1.67	1.51	1.61	1.6
Mean		1.7	1.6	1.6	1.6

	UK	CN	F	Mean
UK	-	0.89778322	0.97632412	0.98157832
CN		-	0.93451652	0.93451652
F			-	0.9916524
Mean				-

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Comparison of software in COYU

- Calculated adjusted logSD (U_C):
  - Example with 2 characteristics: UPOV n°9 – Plant: growth habit at inflorescence emergence

	UPOV n°9 Plant: growth habit at inflorescence emergence				
N° Variety	**Varieties**	**UK**	**CN**	**F**	**Mean**
105	Candidate A	0.70	0.65	0.66	0.67
108	Candidate B	0.69	0.65	0.63	0.7
121	Candidate C	0.65	0.61	0.62	0.6
122	Candidate D	0.64	0.61	0.58	0.6
123	Candidate E	0.61	0.59	0.54	0.6
124	Candidate F	0.68	0.64	0.64	0.7
125	Candidate G	0.64	0.62	0.6	0.6
126	Candidate H	0.72	0.70	0.69	0.7
127	Candidate I	0.76	0.74	0.77	0.8
Mean		0.7	0.6	0.6	0.7

	UK	CN	F	Mean
UK	-	0.97847568	0.97671912	0.99274776
CN		-	0.96720971	0.96720971
F			-	0.9921783
Mean				-

  - Some differences between participants in all characteristics
  - Very good correlations

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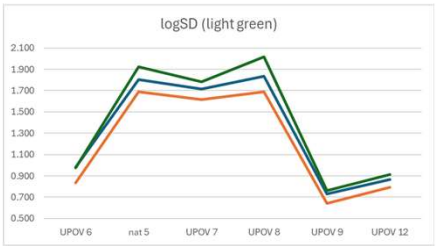
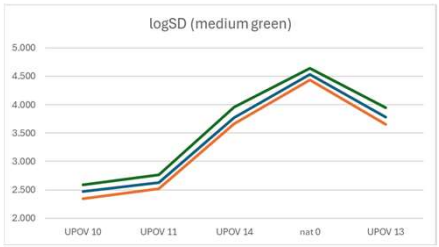
Comparison of software in COYU

- Decisions ($UC_{p0.001}$):
  - Results of threshold calculations show differences:

Lower from China
Medium from UK
Higher from France

		CA801	CA982	CA809	CA910	CA811	CA817	CA880	CA813	CA819	CA870	CA844
		UPOV 6	**nat 5**	**UPOV 7**	**UPOV 8**	**UPOV 9**	**UPOV 12**	**UPOV 10**	**UPOV 11**	**UPOV 14**	**nat 0**	**UPOV 13**
UCp=0.001	UK	0.980	1.803	1.714	1.834	0.728	0.865	2.472	2.628	3.770	4.532	3.782
	CN	0.836	1.688	1.614	1.688	0.642	0.794	2.343	2.518	3.664	4.432	3.653
	F	0.976	1.924	1.782	2.020	0.764	0.915	2.593	2.762	3.959	4.643	3.945





LSD UK LSD CN LSD F

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Comparison of software in COYU

- Decisions ($UC_{p0.001}$):
  - Participant decisions:

		UPOV 10			UPOV 11			UPOV 14			nat 0			UPOV 13		
		UK	CN	F-r	UK	CN	F-r	UK	CN	F-r	UK	CN	F-r	UK	CN	F-r
		2.472	2.343	2.593	2.628	2.518	2.762	3.770	3.664	3.959	4.532	4.432	4.643	3.782	3.653	3.945
105	Candidate A	2.366	2.3531	2.36	2.6001	2.6259	2.63	3.6568	3.6895	3.62	4.3535	4.3549	4.34	3.5967	3.6077	3.6
108	Candidate B	2.3735	2.3356	2.34	2.5445	2.5154	2.53	3.6988	3.6628	3.64	4.3941	4.3672	4.37	3.5328	3.5639	3.52
121	Candidate C	2.3062	2.3168	2.31	2.5885	2.5863	2.59	3.4448	3.4383	3.35	4.4685	4.4763	4.46	3.7004	3.6967	3.69
122	Candidate D	2.3855	2.3855	2.38	2.617	2.6151	2.62	3.6903	3.6909	3.65	4.3867	4.4045	4.38	3.7127	3.7257	3.76
123	Candidate E	2.3325	2.3274	2.33	2.4853	2.4775	2.49	3.6307	3.6179	3.63	4.433	4.4162	4.42	3.6308	3.5951	3.61
124	Candidate F	2.326	2.3102	2.33	2.4872	2.4749	2.47	3.6697	3.6803	3.7	4.5099	4.5362	4.5	3.5659	3.5546	3.55
125	Candidate G	2.2765	2.2617	2.25	2.5504	2.5453	2.55	3.7518	3.7577	3.78	4.5428	4.4955	4.51	3.6713	3.6485	3.67
126	Candidate H	2.3824	2.4057	2.42	2.5299	2.5146	2.52	3.7837	3.7882	3.71	4.4979	4.5106	4.51	3.7208	3.7044	3.7
127	Candidate I	2.3395	2.3265	2.34	2.4645	2.445	2.45	3.6622	3.6678	3.58	4.3891	4.4122	4.39	3.6654	3.6693	3.68

		UPOV 6			nat 5			UPOV 7			UPOV 8			UPOV 9			UPOV 12		
		UK	CN	F-r	UK	CN	F-r	UK	CN	F-r	UK	CN	F-r	UK	CN	F-r	UK	CN	F-r
		0.980	0.836	0.976	1.803	1.688	1.924	1.714	1.614	1.782	1.834	1.688	2.020	0.728	0.642	0.764	0.865	0.794	0.915
105	Candidate A	0.8458	0.8608	0.84	1.669	1.6631	1.66	1.5849	1.6062	1.56	1.4328	1.4298	1.5	0.6969	0.6513	0.66	0.7428	0.7471	0.74
108	Candidate B	0.8335	0.7999	0.81	1.6723	1.6575	1.63	1.7071	1.6658	1.68	1.6673	1.6836	1.66	0.6897	0.6498	0.63	0.7977	0.7898	0.79
121	Candidate C	0.853	0.5672	0.83	1.6928	1.6697	1.66	1.5778	1.5775	1.54	1.6362	1.6038	1.6	0.6496	0.6141	0.62	0.7502	0.7393	0.75
122	Candidate D	0.8825	0.6149	0.86	1.6017	1.6228	1.61	1.4563	1.4681	1.43	1.6759	1.632	1.68	0.6363	0.6094	0.58	0.8127	0.8123	0.79
123	Candidate E	0.9381	0.9882	0.88	1.5974	1.5981	1.59	1.5149	1.5167	1.51	1.5941	1.6337	1.59	0.6086	0.5893	0.54	0.809	0.7901	0.8
124	Candidate F	0.8027	0.9891	0.78	1.6517	1.6437	1.64	1.5808	1.5676	1.53	1.7062	1.7476	1.69	0.6758	0.6384	0.64	0.8653	0.8465	0.85
125	Candidate G	0.9755	0.8731	0.77	1.7383	1.6746	1.7	1.6466	1.6415	1.63	1.5442	1.4593	1.49	0.6375	0.6178	0.6	0.7831	0.7854	0.77
126	Candidate H	0.8877	0.9044	0.78	1.7446	1.7358	1.72	1.577	1.5489	1.56	2.1054	1.9264	1.99	0.7203	0.7007	0.69	0.8466	0.8338	0.82
127	Candidate I	0.9589	0.9085	0.85	1.7243	1.7122	1.7	1.6852	1.6715	1.63	1.6798	1.5119	1.61	0.762	0.7358	0.77	0.8354	0.8318	0.84

- Calculations with UK and France drive to **the same decisions (2 candidates NU)**
- Question about different decisions from CN

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Conclusions

- COYD:
  - The results show light differences in calculation
  - The decisions are similar despite the software

- COYU:
  - Calculated adjusted logSD (U_c) are similar
  - Slight differences with Rejection Threshold between UK and FR
  - High differences with Rejection Threshold in DUSCEL (CN)
  - **Decisions are similar with UK and FR**

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To be continued

- Check new corrective version on DUSCEL for moving average to confirm results
- To consolidate efficiency between users:
  - Explore light differences observed previously (calculation ways in particular, etc.)
  - **Proposition to check COYU spline** using in the same way
  - Think about improve explanation guidance on document TGP/8 Chap.9 (COYU)

Thank you to all participants and contributors

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Thank you for your attention !

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[End of Annex and of document]