UPOV

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EXCHANGE AND USE OF SOFTWARE AND EQUIPMENT

Document prepared by an expert from China

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The annex to this document contains a copy of a presentation "A Statistical Analysis Software: DUSCEL4.0", made by an expert from China, at the fifty-sixth session of the TWV.

[Annex follows]

A STATISTICAL ANALYSIS SOFTWARE：DUSCEL3.5

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TWV56, Virtual meeting, April 18 to 22, 2022

CONTENTS

- 1. History
- 2. Features
- 3. Functions
- 4. Future

HISTORY

1. 2017-2019, EXCEL+VBA+UI=DUSCEL
2. 2019, V1.0, 12 sheets and 46 functions, reported in TWC37.
3. 2020, V2.0, 6 sheets and 55 functions, reported in TWC38.
4. 2021, V2.5, 7 sheets and 52 functions, reported in TWA50.
5. 2021, V3.0, 5 sheets and 42 functions, reported in TWC39.
6. 2022, V3.5, 8 sheets and 35 functions, reported in TWV56.
7. 2022, V4.0, 8 sheets and 20 functions, reported in TWM1.

TWV52 BEIJING, 2018.9.19

FEATURES

1. How to save and manage data easily? DUSCEL is Excel.

2. How to analyze data efficiently? One data for all analysis.

3. How to make decision effectively? Fixed data leads to fixed result.

1. IT'S AN EASY NEW SOLUTION: DUSCEL IS EXCEL.

2. IT'S AN EFFICIENT NEW TOOL : ONE DATA FOR ALL ANALYSIS.
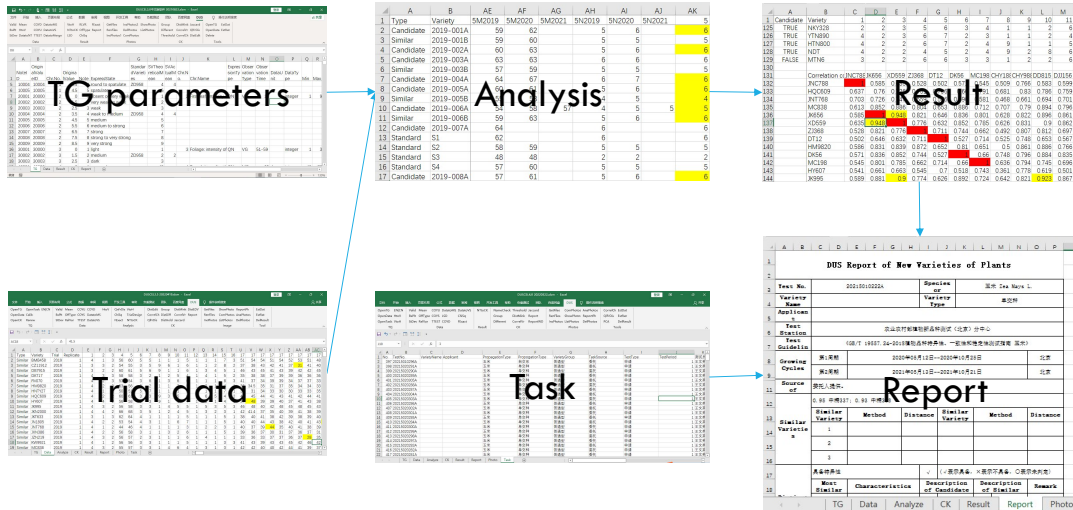
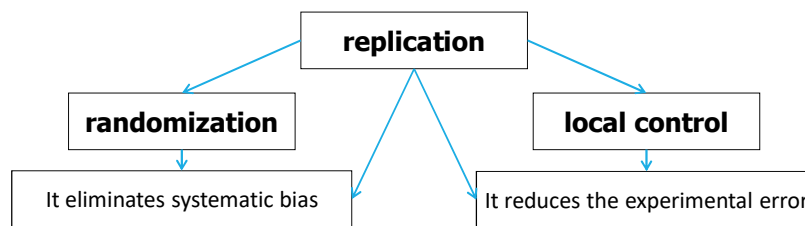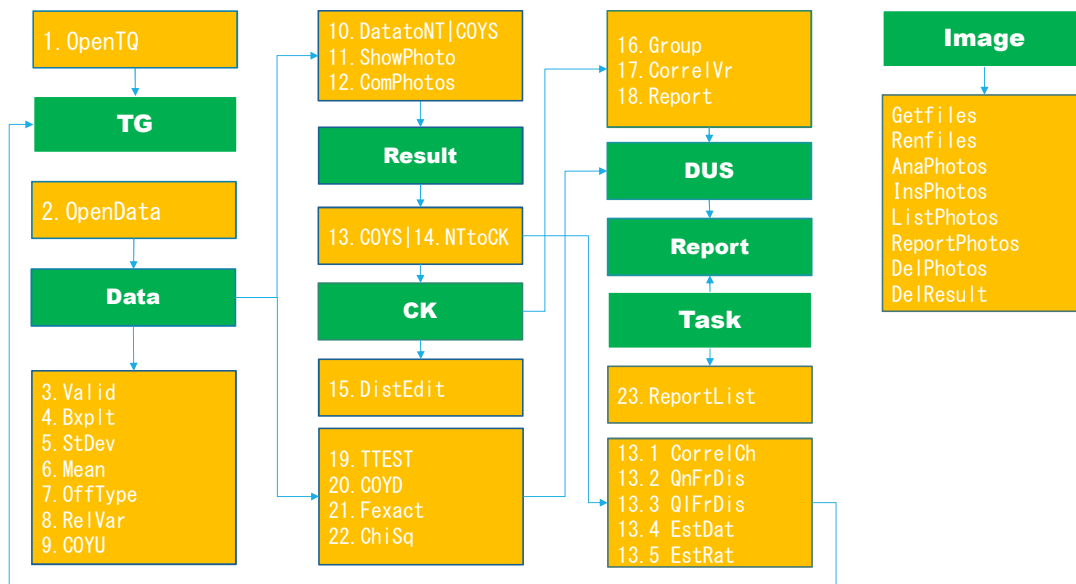## 3. IT'S AN EFFECTIVE NEW FLOW : FIXED DATA LEADS TO FIXED RESULT.
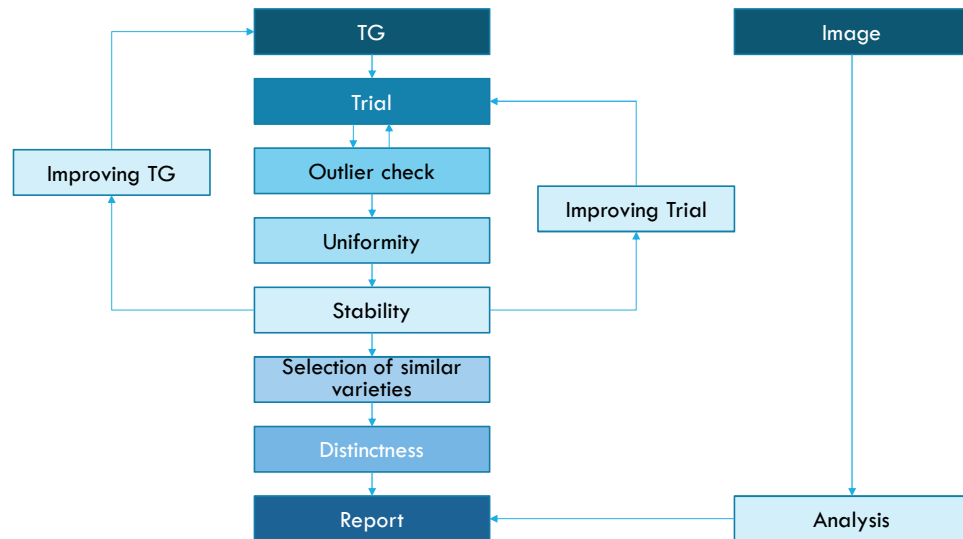
3. IT'S AN EFFECTIVE NEW FLOW : FIXED DATA LEADS TO FIXED RESULT.

DUS testing is based on field growing trial. Minimum distance of DUS is determined by error I and error II of field growing trial. Quality of field growing trial is influenced by replication, randomization and local control.

```
                      replication
                      
    randomization                    local control
          
It eliminates systematic bias     It reduces the experimental error
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FUNCTIONS

1. OpenTQ	10. DatatoNT|COYS 11. ShowPhoto 12. ComPhotos	16. Group 17. CorrelVr 18. Report	**Image**
TG	**Result**	**DUS**	Getfiles Renfiles AnaPhotos InsPhotos ListPhotos ReportPhotos DelPhotos DelResult
2. OpenData	13. COYS|14. NTtoCK	**Report**	
Data	**CK**	**Task**	
3. Valid 4. Bxplt 5. StDev 6. Mean 7. OffType 8. RelVar 9. COYU	15. DistEdit	23. ReportList	
	19. TTEST 20. COYD 21. Fexact 22. ChiSq	13.1 CorrelCh 13.2 QnFrDis 13.3 QlFrDis 13.4 EstDat 13.5 EstRat	

FUNCTIONS

■Methods for Batch renaming, compressing, labeling, checking photo files.

■Checking abnormal data by Valid, BxPlt and StDev.

■Analysis of uniformity by off-type, relative variance, COYU.

■Converting measured data to notes by fixed scale and changed standard varieties' actual value. Analysis of stability by COYS for varieties or characteristics.

■Methods for verification of characteristics or trial by CorrelCh, QnFrDis, QlFrDis, EstDat and EstRat.

■Selection of similar varieties by Group, CorrelVr, DistMink, DistDiff, etc.

■Analysis of distinctness by T-test, LSD, COYD, ChiSq, Fexact, Etc.

■Report automatically.

WHOLE SOLUTION FOR CHECKING ABNORMAL DATA
VALID | BXPLT | STDEV | MEAN

ANALYSIS OF UNIFORMITY

COYU

Off-type

Relative Variance

WHOLE SOLUTION FOR GENERATING NOTES

1. calculate mean, note of each Chr. of each trial.
2. sent means of standard varieties to TG sheet.
3. update scale by standard mean and actual mean of standard varieties.
4. generate scale notes trial by trial.
5. generate average notes for all trial.
6. check coefficient of correlation and note distance by varieties and Chr.s.
7. check or compare photos with notes for each trial.
8. send final note to CK.

COYS

MEAN AND NOTE

	A	B	AE	AF	AG	AH	AI	AJ	AK	AL	AM	AN	AO	AP	AQ	AR
1	Type	Variety	5M2019	5M2020	5M2021	5N2019	5N2020	5N2021	5	6M2019	6M2020	6M2021	6N2019	6N2020	6N2021	6
2	Candidate	2019-001A	59	62		5	6		6				5	4		4
3	Similar	2019-001B	59	60		5	5		5				3	3		3
4	Candidate	2019-002A	60	63		5	6		6				2	4		3
5	Candidate	2019-003A	63	63		6	6		6				2	3		2
6	Similar	2019-003B	57	59		5	5		5				2	2		2
7	Candidate	2019-004A	64	67		6	7		6				3	3		3
8	Candidate	2019-005A	60	61		5	6		6				3	3		3
9	Similar	2019-005B	55	58		4	5		4				3	3		3
10	Candidate	2019-006A	54	58	57	4	5	5	5				4	4	3	4
11	Similar	2019-006B	59	63		5	6		6				3	3		3
12	Candidate	2019-007A	64			6			6				2			2
13	Standard	S1	62			6			6				2			2
14	Standard	S2	58	59		5	5		5				3	3		3
15	Standard	S3	48	48		2	2		2				4	3		4
16	Standard	S4	57	60		5	5		5				3	3		3
17	Candidate	2019-008A	57	61		5	6		6				2	2		2

COYS

	A	B	C	D	E
131	Type	Variety	Number of trials	Note-2019: 2020	
249	Candidate	YTN890	2	0.938038724	
250	Candidate	Z013	2	0.929210603	
251	Candidate	ZHT1931	2	0.883684001	
252	Candidate	ZHT1932	2	0.858238962	
253	Candidate	ZHT1941	2	0.615646481	
254	Candidate	ZHT1942	2	0.551816801	
255	Candidate	ZJ368	2	0.960838943	
256	Candidate	ZNT808	2	0.940061813	
257	Candidate	ZNT828	2	0.948459018	
258	Candidate	ZR1	2	0.607362311	
259	Candidate	ZT192	2	0.890731315	
260		Min		0.531928187	
261		Mean		0.886030597	
262		Max		0.983729219	
263	Type	Chr.	Mean2019: 2020	Note2019: 2020	
264	VG	1 First leaf: shape of apex		0.395970904	
267	MG	4 *Tassel: time of anthesis	0.914650448	0.845777949	
268	MG	5 Ear: time of silk emergence	0.908648888	0.752215479	
308		Min	0.715572857	0.091140749	
309		Mean	0.844120009	0.728106606	
310		Max	0.950703848	1	

| ‹ | › | | TG | Data | Analyze | CK | Result | Report | Photo | Task | ⊕ |

SELECTION OF SIMILAR VARIETIES

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T
1	Type	Variety	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
125	Candidate	ZJ368	4	4	3	4	2	3	4	1	2	2	6	1	5	1	4	1	6	6
126	Candidate	ZNT808	4	1	3	2	1	6	5	1	1	1	5	1	1	1	4	1	6	5
127	Candidate	ZNT828	4	1	3	1	1	5	5	1	1	1	5	1	1	1	5	1	4	3
128	Candidate	ZR1	4	6	2	4	1	3	2	5	2	4	4	1	4	3	6	2	8	6
129	Candidate	ZT192	4	4	2	2	1	4	2	1	1	2	6	1	2	1	6	2	6	6
130																				
131		Correl	BM380	BM4192	BM492	BTN1888	CHY188	CHY988	CZ1091	DB1943	DB240	DB2916	DB6910	DD806	DD815	DJJ156	DK193	DK229	DK56	DLN901
132		BMB458	0.85781	0.84337	0.86101	0.6726	0.21364	0.5805	0.60427	0.29	0.73184	0.51042	0.8289	0.55508	0.63202	0.52713	0.47714	0.70548	0.42294	0.61165
133		CZ11912	0.4735	0.49742	0.4847	0.50005	0.28569	0.42324	0.85576	0.84538	0.65748	0.87855	0.64611	0.2349	0.30204	0.25405	0.56314	0.38413	0.14786	0.2605
134		DB7915	0.51853	0.57046	0.52297	0.40592	0.32887	0.59756	0.66968	0.65467	0.59908	0.88869	0.74082	0.40156	0.37452	0.33721	0.68758	0.41808	0.18591	0.39757
135		DK717	0.44913	0.52183	0.41804	0.62383	0.66821	0.84675	0.41984	0.18614	0.54484	0.31261	0.59843	0.85768	0.89632	0.86645	0.6458	0.86876	0.89445	0.82487
136		FMJ70	0.68288	0.73318	0.6863	0.87037	0.24768	0.40343	0.6196	0.39106	0.69606	0.50362	0.68124	0.49656	0.52447	0.45529	0.33838	0.50061	0.3982	0.43356
137		HM9820	0.59935	0.64556	0.57723	0.52071	0.53812	0.8575	0.38273	0.17398	0.5365	0.31789	0.64228	0.8214	0.86874	0.76966	0.65948	0.8736	0.80031	0.87606
138		HNTY27	0.88961	0.92575	0.90802	0.62584	0.08786	0.4137	0.5905	0.24863	0.68919	0.50051	0.76145	0.42544	0.47599	0.36648	0.29168	0.51611	0.27353	0.46653
139		HQC609	0.3508	0.40252	0.31625	0.367	0.69955	0.81767	0.40663	0.41962	0.4353	0.49681	0.52876	0.77001	0.78106	0.77427	0.81062	0.73395	0.64222	0.72313
140		HY607	0.66658	0.66253	0.59552	0.39163	0.36184	0.73875	0.4912	0.42538	0.48297	0.58149	0.64441	0.50573	0.57138	0.46722	0.74828	0.62913	0.43447	0.54499
141		JK995	0.5792	0.57565	0.51151	0.53332	0.65084	0.80131	0.41214	0.1673	0.55045	0.26972	0.58771	0.80892	0.90814	0.85798	0.61543	0.88093	0.85299	0.89713
142		JKN2000	0.44249	0.58098	0.45864	0.78667	0.42191	0.52907	0.49016	0.30429	0.55497	0.45347	0.63593	0.6955	0.58053	0.55832	0.47265	0.5742	0.55009	0.45169
143		JKT633	0.72201	0.77186	0.71504	0.67841	0.26381	0.60098	0.47263	0.29101	0.62965	0.39329	0.68938	0.61149	0.67154	0.5705	0.50705	0.70779	0.4717	0.58555
144		JN1805	0.66499	0.74599	0.69072	0.83198	0.33554	0.53038	0.53226	0.33156	0.63499	0.48052	0.70614	0.61949	0.64907	0.55824	0.43365	0.52286	0.51856	0.49386
145		JNT768	0.60473	0.62017	0.58313	0.32911	0.54828	0.71576	0.40466	0.13736	0.52752	0.35071	0.64649	0.60463	0.71836	0.73504	0.49982	0.72781	0.61807	0.80353

| ‹ | › | | TG | Data | Analyze | CK | Result | Report | Photo | Task | ⊕ |

REPORT

Chr.No.	Chr.Name性状名称	JK656-2019	XD559-2019	Diff差异	JK656-2020	XD559-2020	Diff差异
1	First leaf: shape of apex	4	4		4	4	
2	First leaf: intensity of anthocyanin colo	4	4		4	5	1
3	Foliage: intensity of green color	3	3		3	3	
4	Tassel: time of anthesis	56	56		59	58	1
5	Ear: time of silk emergence	58	57	1	60	60	
6	Leaf: angle between blade and stem	2	3	1	2	3	1
7	Leaf: curvature of blade	2	1	1	2	1	1
8	leaf.anthocyanin coloration of margin	1	1		1	1	
9	Ear: intensity of anthocyanin coloration	2	2		2	2	
10	Tassel: intensity of anthocyanin colora	5	6	1	5	6	1
11	Tassel: density of spikelets	5	5		5	5	
12	Tassel: intensity of anthocyanin colorat	1	1		1	1	
13	Tassel: intensity of anthocyanin colorat	5	5		5	5	
14	Tassel: intensity of anthocyanin colorat	1	1		1	1	
15	Tassel: angle between main axis and la	5	5		6	5	1
16	Tassel: curvature of lateral branches	1	1		1	1	
17	Tassel: length of main axis above lowe	37.9	43.65	3.7755E-11	41.22	45.015	1.0114E-06
18	Tassel: length of main axis above high	27.95	27.95	1	30.195	30.765	0.33933781
19	Tassel: number of primary lateral bran	12	15.35	8.5449E-05	12.7	14.05	0.02186513
20	Tassel: length of lateral branches	24.075	27.05	8.7611E-06	26.925	28.6	0.02608356
21	Stem: degree of zig-zag	1	1		1	1	
22	Stem: intensity of anthocyanin colorati	4	3	1	4	3	1

ANALYSIS OF DISTINCTNESS——T TEST

ANALYSIS OF DISTINCTNESS——COYD

CHECKING AND RENAMING PHOTO FILES

ANALYSIS OF PHOTOS

VERIFICATION OF CHARACTERISTICS AND TRIAL

Estimate sample size by normal data

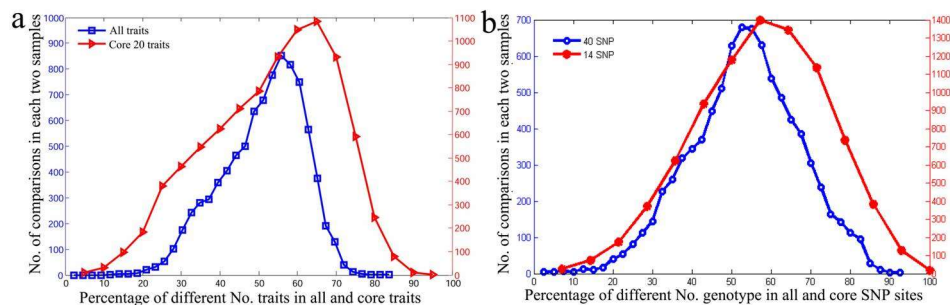Estimate sample size by rate data

FUTURE

◆1. to develop DUSCEL4.0 for TWM1 meeting.

◆2. to reduce data analysis functions and increase image analysis functions.

◆3. to write a book on DUS theory based on field growing trial.

◆4. to draft a test guideline on trial design and data analysis on DUS.

◆5. to draft a protocol on image taking and analysis.

FUTURE

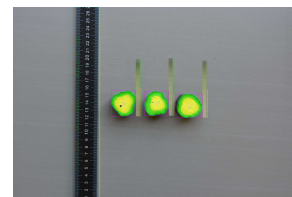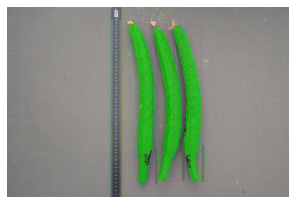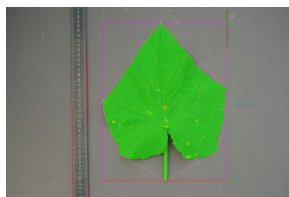◆6. Explore forecast model between molecular distance and morphological distance.

FUTURE

◆7. Developing a big data platform for DUS Examination (4.0).

THANK YOU FOR YOUR ATTENTION!

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