

Technical Working Party on Automation and Computer Programs**TWC/39/6****Thirty-Ninth Session****Alexandria, United States of America, September 20 to 22, 2021****Original:** English**Date:** August 18, 2021

EXCHANGE AND USE OF SOFTWARE AND EQUIPMENT*Document prepared by an expert from China**Disclaimer: this document does not represent UPOV policies or guidance*

The annex to this document contains a copy of a presentation on “A Statistical Analysis Software: DUSCEL3.0”, prepared by an expert from China, to be made at the thirty-ninth session of the Technical Working Party on Automation and Computer Programs (TWC).

[Annex follows]



IVF CAAS
Institute of Vegetables and Flowers
Chinese Academy of Agricultural Sciences



A STATISTICAL ANALYSIS SOFTWARE : DUSCEL3.0

▪ Yang Kun, Deputy director, Associate Researcher
Beijing Sub-center of New Plant Variety Tests, MARA, P. R. China
TWC39, Alexandria, United States of America, September 20 to September 22, 2021

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- HISTORY
- AIMS
- FUNCTIONS AND APPLICATIONS
- DISCUSSIONS
- PLANS

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.

AIMS

1. **Easy: how Excel work, how DUSCEL work.**

Use Excel files to manage and analyze data and photos of DUS trials.

2. **Efficient: one data, all analysis.**

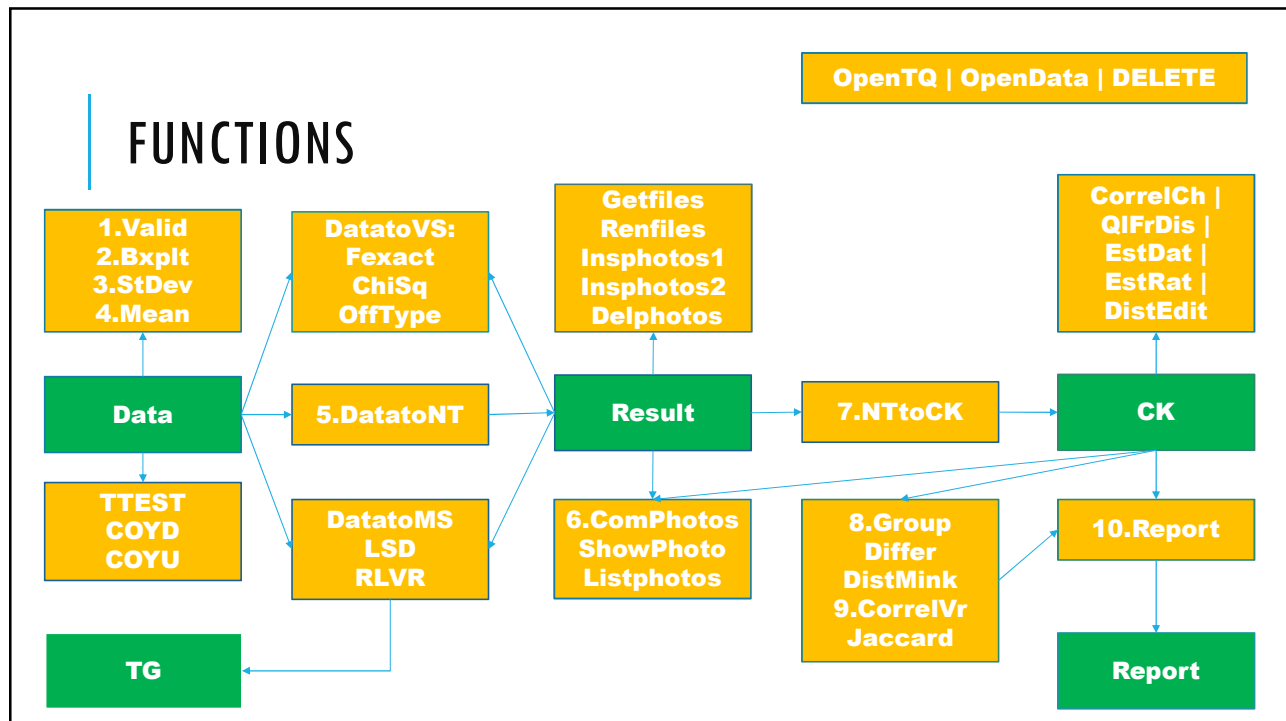
Develop statistical methods for DUS based on one TG table and data table.

3. **Effective: fixed data, fixed result.**

Improve a DUS judgment solution by a closed-loop, self-explaining, consistent with statistical and genetic theory, constant result procedure.

FUNCTIONS

- Checking abnormal data by validation, boxplot and standard deviation methods.
- Producing note from original data by a fixed scale and changed standard varieties' actual value.
- Analysis of distinctness by note level, data level and photo level.
- Analysis of uniformity by off-type, relative variance, COYU.
- Analysis of stability by COYS for varieties or characteristics.
- Methods for Batch Checking and Renaming of photo files.
- Methods for verification of Characteristics and trial by CorrelCh, QLFrDis, QNFrDis, COYS, EstDat and EstRat.



DUSCEL2.5 20210605.xlsx - Excel

文件 开始 插入 页面布局 公式 数据 审阅 视图 开发工具 帮助 负载测试 团队 百度网盘 DUS 操作说明搜索 共享

Calib	Valid	Mean	DatatoRLVR	DatatoCHI	VtoH	QnFrDis	STNT	OffTp	COYD	FExact	COYS	Group	DistMink	Jaccard	GetFiles	InsPhotos2	CN	EstDat	
Renew	BxPlt	HtoV	DatatoCOYU	DatatoMean		COYtoTG	CKNT	RLVR	TTEST	ComPhotos	Report	Different	CorrelVr	QlFrDis	RenFiles	DelPhotos	EN	EstRat	
TG	StDev	DatatoNT	DatatoCOYD	DatatoMerge	Process	COYtoCK	RENT	COYU	ChiSq	ShowPhoto		Threshold	CorrelCh	ListPhotos	InsPhotos1	Photo	Del	DistEdit	
		Data				COY			COY				CK				Tool		
	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S
1	NoteID	Original Value	Chr.No.	Original Value	Note	ExpressState	Standard Varieties	SVTheoreticalMean	SVActualMean	Chr.No.	Chr.Name	ExpressionType	ObservationType	ObservationTime	Data Unit	Data Type	Min	Max	Group
2	10001	10000	1	0	1	pointed		1		1	First leaf: shape of ap	PQ	VG	13	integer		1	5	
3	10002	10002	1	1.5	2	pointed to round		2											
4	10003	10003	1	2.5	3	round		3											
5	10004	10004	1	3.5	4	round to spatulate	ZD958	4	4										
6	10005	10005	1	4.5	5	spatulate		5											
7	20001	20000	2	0	1	absent or very weak		1		2	First leaf: intensity of	QN	VG	14	integer		1	9	
8	20002	20002	2	1.5	2	very weak to weak		2											
9	20003	20003	2	2.5	3	weak		3											
10	20004	20004	2	3.5	4	weak to medium	ZD958	4	4										
11	20005	20005	2	4.5	5	medium		5											
12	20006	20006	2	5.5	6	medium to strong		6											
13	20007	20007	2	6.5	7	strong		7											
14	20008	20008	2	7.5	8	strong to very strong		8											
15	20009	20009	2	8.5	9	very strong		9											
16	30001	30000	3	0	1	light		1		3	Foliage: intensity of g	QN	VG	51-59	integer		1	3	
17	30002	30002	3	1.5	2	medium	ZD958	2	2										
18	30003	30003	3	2.5	3	dark		3											

就绪 130%

DUSCEL2.5 20210605.xlsx - Excel

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Calib	Valid	Mean	DatatoRLVR	DatatoCHI	VtoH	QnFrDis	STNT	OffTp	COYD	FExact	COYS	Group	DistMink	Jaccard	GetFiles	InsPhotos2	CN	EstDat	
Renew	BxPlt	HtoV	DatatoCOYU	DatatoMean		COYtoTG	CKNT	RLVR	TTEST	ComPhotos	Report	Different	CorrelVr	QlFrDis	RenFiles	DelPhotos	EN	EstRat	
TG	StDev	DatatoNT	DatatoCOYD	DatatoMerge	Process	COYtoCK	RENT	COYU	ChiSq	ShowPhoto		Threshold	CorrelCh	ListPhotos	InsPhotos1	Photo	Del	DistEdit	
		Data				COY			COY				CK				Tool		
	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S
1	Candidate	Variety	Trial	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
2	FALSE	BMB458	2019	4	1	3	56	60	5	1	1	1	7	3	51	54	54	51	54
3	FALSE	CZ11912	2019	3	3	2	54	55	3	5	9	6	1	6	1	2	8	2	37
4	FALSE	DB7915	2019	3	2	2	60	61	5	6	9	1	1	6	1	3	4	5	1
5	FALSE	DK717	2019	4	3	3	58	58	3	2	1	2	5	4	1	4	1	5	2
6	FALSE	FMJ70	2019	4	2	3	53	54	3	6	1	3	6	6	1	1	1	8	3
7	FALSE	HM9820	2019	4	2	2	53	56	3	2	1	1	2	5	1	2	1	4	1
8	FALSE	HNTY27	2019	4	1	2	50	51	5	7	1	1	1	5	1	1	1	7	1
9	FALSE	HQC609	2019	4	2	2	60	61	3	3	9	3	5	6	1	6	5	4	2
10	FALSE	HY607	2019	4	4	2	56	58	2	3	9	1	1	4	1	2	1	4	1
11	FALSE	JK995	2019	4	3	2	56	58	3	3	1	4	5	5	1	5	3	5	3
12	FALSE	JKN2000	2019	4	4	2	66	68	3	5	1	2	4	5	1	3	2	3	1
13	FALSE	JKT633	2019	3	1	3	62	64	4	1	1	1	1	5	1	1	5	1	38
14	FALSE	JN1805	2019	4	2	2	53	54	4	3	1	1	6	7	1	1	1	5	1
15	FALSE	JNT768	2019	4	1	2	44	46	4	1	1	1	1	3	1	2	2	3	1
16	FALSE	JXN386	2019	4	2	2	56	58	3	1	1	3	2	6	1	1	1	5	1
17	FALSE	JZN219	2019	4	3	2	56	57	2	3	1	1	1	6	1	4	1	1	1
18	FALSE	KW9921	2019	4	1	2	56	56	3	3	1	1	1	5	1	1	1	3	3
19	FALSE	MC838	2019	4	3	2	55	57	3	3	1	4	6	4	1	3	1	3	1
20	FALSE	MTN6	2019	2	2	3	61	62	3	3	1	2	3	7	1	4	3	5	2
21	FALSE	NK998	2019	4	4	2	58	59	3	2	9	7	5	4	1	5	1	2	1
22	FALSE	SB725	2019	4	3	3	53	55	2	2	1	3	2	5	1	5	1	2	1
23	FALSE	SDB4	2019	4	3	2	61	63	5	7	9	7	3	5	1	3	1	7	3
24	FALSE	SDN60	2019	4	3	3	59	60	3	1	1	3	2	5	1	4	1	2	1

就绪 100%

WHOLE SOLUTION FOR CHECKING ABNORMAL DATA

VALID | BXPLT | STDEV

Callb	Valid	Mean	DatatoRLVR	DatatoCHI	VchH	QnFrDis	STNT	OHTP	COYD	FExact	COYS	Group	DistMink	Jaccard	GetFiles	InsPhotos2	CN	EstDat	
Renew	BxPlt	Hovv	DatatoCOVD	DatatoMerge	COYoToCK	CKNT	RLVR	TEST	ComPhotos	Report	COYS	Different	CorreCh	QIFrDis	RenFiles	DelPhotos	EN	EstRat	
TG					COY	CK	COYU	ChSq	ShowPhoto		CK				Photo				
1	FALSE	BV9408	2019	4	1	3	29	0	1	1	3	1	1	1	1	1	1	1	1
2	FALSE	CZ11912	2019	3	3	2	54	55	3	5	9	6	1	6	1	1	2	8	2
3	FALSE	DB7915	2019	3	2	2	60	61	5	6	9	1	1	6	1	3	4	5	1
4	FALSE	DK717	2019	4	3	3	58	58	3	2	1	2	5	4	1	4	1	5	2
5	FALSE	FM170	2019	4	2	3	53	54	3	6	3	6	6	1	1	1	8	3	4
6	FALSE	HM9920	2019	4	2	2	53	56	3	2	1	1	2	5	1	2	1	4	1
7	FALSE	HNTY27	2019	4	1	2	60	51	5	7	1	1	1	5	1	1	7	1	35
8	FALSE	HQC609	2019	4	2	2	60	61	3	3	9	3	5	6	1	6	5	4	2
9	FALSE	HY607	2019	4	4	2	56	58	2	3	9	1	1	4	1	2	1	4	1
10	FALSE	JK995	2019	4	3	2	56	58	3	3	1	4	5	5	1	5	3	5	3
11	FALSE	JKN2000	2019	4	4	2	66	69	3	5	1	2	4	5	1	3	2	3	1
12	FALSE	JKT633	2019	3	1	3	62	64	4	1	1	1	1	5	1	1	5	1	38
13	FALSE	JN1805	2019	4	2	2	53	54	4	3	1	1	6	7	1	1	1	5	1
14	FALSE	JNT768	2019	4	1	2	44	46	4	1	1	1	1	3	1	2	2	3	1
15	FALSE	JKN386	2019	4	2	2	56	58	3	1	1	3	2	6	1	1	1	5	1
16	FALSE	JZN219	2019	4	3	2	56	57	2	3	1	1	1	6	1	4	1	1	1
17	FALSE	KW9921	2019	4	1	2	56	56	3	3	1	1	1	5	1	1	1	3	3
18	FALSE	M838	2019	4	3	2	55	57	3	3	1	4	6	4	1	3	1	3	1
19	FALSE	M838	2019	4	3	2	55	57	3	3	1	4	6	4	1	3	1	3	1
20	FALSE	MTN6	2019	2	2	3	61	62	3	3	1	2	3	7	1	4	3	5	2
21	FALSE	NK998	2019	4	4	2	58	59	3	2	9	7	5	4	1	5	1	2	1
22	FALSE	S8725	2019	4	3	3	53	55	2	2	3	2	5	1	5	1	2	1	47
23	FALSE	SDB4	2019	4	3	2	61	63	5	7	9	7	3	5	1	3	1	7	3
24	FALSE	SDN60	2019	4	3	3	59	60	3	1	1	3	2	5	1	4	1	2	1
25	FALSE	SDT236	2019	4	1	3	57	59	3	4	1	1	1	5	1	1	1	7	4
26	FALSE	WZ1227	2019	4	1	2	59	60	2	3	1	1	1	6	1	1	1	7	2
27	FALSE	XD7038	2019	4	3	3	56	56	3	2	1	2	3	5	1	3	1	2	1
28	FALSE	XY335	2019	4	3	2	56	56	2	1	9	4	5	6	1	1	1	4	1
29	FALSE	Z7369	2019	4	3	2	57	58	1	3	1	4	4	7	1	3	1	2	1

WHOLE SOLUTION FOR GENERATING NOTES

1. calculate mean, SD, sample size, 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 st. notes and average of trial notes.
5. check COYS if there are varieties or Chr.s with problem.
6. check photos if there is big difference between trials.
7. send final note to CK.

New DatatoNT

variety	plant height 2020	plant height 2021	average	2020 note by unchanged scale	2021 note by unchanged scale	2021 note by 10cm-changed scale	2021 note by 20cm-changed scale	2021 note by 30cm-changed scale	average of notes by mean and unchanged scale	average of notes	first year note by retrersion of second year	second year note by retrersion of first year
FQ001	70.9	41.9	56.4	5	2	3	4	5	4	4	7	2
FQ002	75	48.6	61.8	6	3	4	5	6	4	5	7	3
FQ003	73.6	45.2	59.4	5	3	4	5	6	4	4	7	2
FQ004	75	48.4	61.7	6	3	4	5	6	4	5	7	3
FQ005	90	55.7	72.85	7	4	5	6	7	5	6	8	4
FQ006	99.2	51.9	75.55	8	3	4	5	6	6	6	8	3
FQ007	82.9	51.4	67.15	6	3	4	5	6	5	5	8	3
FQ008	95.2	52.8	74	8	3	4	5	6	5	6	8	3
FQ009	94.3	50.4	72.35	7	3	4	5	6	5	5	8	3
FQ010	70.7	48.9	59.8	5	3	4	5	6	4	4	7	3
FQ011	89.1	52.9	71	7	3	4	5	6	5	5	8	3
FQ012	91.2	53.5	72.35	7	3	4	5	6	5	5	8	3
FQ013	89.4	52.7	71.05	7	3	4	5	6	5	5	8	3
FQ014	85.3	53.1	69.2								8	3
FQ015	79.2	53.7	66.45								8	3
FQ016	91.2	51.9	71.55								8	3
FQ017	89.9	53.3	71.6	7	3	4	5	6	5	5	8	3
FQ018	67.2	53.3	60.25	5	3	4	5	6	4	4	7	3
FQ019	89.2	50.2	69.7	7	3	4	5	6	5	5	8	3
FQ020	86.1	52.8	69.45	7	3	4	5	6	5	5	8	3
FQ021	83.6	52.9	68.25	6	3	4	5	6	5	5	8	3
FQ022	87.4	56.1	71.75	7	4	5	6	7	5	6	8	4
FQ023	73.5	59.5	66.5	5	4	5	6	7	5	5	7	4
FQ024	63.7	64.1	63.9	4	4	5	6	7	4	4	7	4
FQ025	100	69.1	84.55	8	5	6	7	8	6	7	8	5
FQ026	70.7	48.9	59.8	5	3	4	5	6	4	4	7	3
FQ027	85.7	68.7	77.2	7	5	6	7	8	6	6	8	5
FQ028	86.1	52.8	69.45	7	3	4	5	6	5	5	8	3
FQ029	90	55.7	72.85	7	4	5	6	7	5	6	8	4
FQ030	89.4	52.7	71.05	7	3	4	5	6	5	5	8	3

Scale's note, regression note, which is better?

COEFFICIENT OF CORRELATION													
coefficient of correlation	plant height 2020	plant height 2021	average	2020 note by unchanged scale	2021 note by unchanged scale	2021 note by 10cm-changed scale	2021 note by 20cm-changed scale	2021 note by 30cm-changed scale	average of notes by mean and unchanged scale	average of notes	2020 note by regression of second year	2021 note by regression of first year	
plant height 2020	1	0.23461	0.89032	0.96204	0.19321	0.19321	0.19321	0.19321	0.82989	0.78939	0.8868	0.23597	
plant height 2021	0.23461	1	0.6515	0.22674	0.9076	0.9076	0.9076	0.9076	0.58026	0.56405	0.27211	0.92755	
average	0.89032	0.6515	1	0.85701	0.57591	0.57591	0.57591	0.57591	0.91947	0.88027	0.81954	0.61863	
2020 note by unchanged scale	0.96204	0.22674	0.85701	1	0.18314	0.18314	0.18314	0.18314	0.79331	0.81283	0.85289	0.24256	
2021 note by unchanged scale	0.19321	0.9076	0.57591	0.18314	1	1	1	1	0.48556	0.61703	0.18738	0.96339	
2021 note by 10cm-changed scale	0.19321	0.9076	0.57591	0.18314	1	1	1	1	0.48556	0.61703	0.18738	0.96339	
2021 note by 20cm-changed scale	0.19321	0.9076	0.57591	0.18314	1	1	1	1	0.48556	0.61703	0.18738	0.96339	
2021 note by 30cm-changed scale	0.19321	0.9076	0.57591	0.18314	1	1	1	1	0.48556	0.61703	0.18738	0.96339	
average of notes by mean and unchanged scale	0.82989	0.58026	0.91947	0.79331	0.48556	0.48556	0.48556	0.48556	1	0.8136	0.76929	0.52899	
average of notes	0.78939	0.56405	0.88027	0.81283	0.61703	0.61703	0.61703	0.61703	0.8136	1	0.6482	0.65462	
first year note by retrersion of second year	0.8868	0.27211	0.81954	0.85289	0.18738	0.18738	0.18738	0.18738	0.76929	0.6482	1	0.24718	
second year note by retrersion of first	0.23597	0.92755	0.61863	0.24256	0.96339	0.96339	0.96339	0.96339	0.52899	0.65462	0.24718	1	

EUCLIDEAN DISTANCE

Euclidean distance	2020 note by unchanged scale	2021 note by unchanged scale	2021 note by 10cm-changed scale	2021 note by 20cm-changed scale	2021 note by 30cm-changed scale	average of notes by mean and unchanged scale	average of notes	2020 note by regression of second year	2021 note by regression of first year
2020 note by unchanged scale	0	18.35756	13.304135	8.7749644	6.0827625	9.486833	8.1853528	7.8740079	18.493242
2021 note by unchanged scale	18.35756	0	5.4772256	10.954451	16.431677	9.2195445	10.392305	24.596748	1
2021 note by 10cm-changed scale	13.304135	5.4772256	0	5.4772256	10.954451	4.5825757	5.4772256	19.209373	5.7445626
2021 note by 20cm-changed scale	8.7749644	10.954451	5.4772256	0	5.4772256	4.1231056	3.4641016	13.892444	11.18034
2021 note by 30cm-changed scale	6.0827625	16.431677	10.954451	5.4772256	0	8.5440037	7.3484692	8.7749644	16.643317
average of notes by mean and unchanged scale	9.486833	9.2195445	4.5825757	4.1231056	8.5440037	0	2.6457513	15.811388	9.3808315
average of notes	8.1853528	10.392305	5.4772256	3.4641016	7.3484692	2.6457513	0	14.73092	10.535654
2020 note by regression of second year	7.8740079	24.596748	19.209373	13.892444	8.7749644	15.811388	14.73092	0	24.779023
2021 note by regression of first year	18.493242	1	5.7445626	11.18034	16.643317	9.3808315	10.535654	24.779023	0
	10.062095	10.71439	7.8029748	7.0382064	8.91743	7.088226	6.975531	14.407652	10.861886

different	2020 note by unchanged scale	2021 note by unchanged scale	2021 note by 10cm-changed scale	2021 note by 20cm-changed scale	2021 note by 30cm-changed scale	average of notes by mean and unchanged scale	average of notes	2020 note by regression of second year	2021 note by regression of first year
2020 note by unchanged scale	0	29	29	25	20	28	28	27	29
2021 note by unchanged scale	29	0	30	30	30	29	29	30	1
2021 note by 10cm-changed scale	29	30	0	30	30	18	24	30	30
2021 note by 20cm-changed scale	25	30	30	0	30	14	9	30	30
2021 note by 30cm-changed scale	20	30	30	30	0	29	28	26	30
average of notes by mean and unchanged scale	28	29	18	14	29	0	7	30	29
average of notes	28	29	24	9	28	7	0	30	29
2020 note by regression of second year	27	30	30	30	26	30	30	0	30
2021 note by regression of first year	29	1	30	30	30	29	29	30	0

what's the result?

Regression method need a lot of conditions and is difficult to produce a perfect note as first year.

COYS

No. 序号	Variety	CC of note代码 相关系数	Not calculate 未计算	0	1	2	3 > 2	Chr 性状	CC of data原始 相关系数	CC of note代码 相关系数	Not calculate 未计算	0	1	2	3 > 2	Type of observati on观测类型
1	BMB458	0.974378	0.002727	0.707273	0.25				1	0.395971	0.395971	0.802013	0.140625	0.039063		VG
2	CC21812	0.916841	0.090909	0.704545	0.183636	0.002727	0.045455		2	0.822405	0.822405	0.5	0.387188	0.109275	0.023428	VG
3	DB7915	0.9181	0.090909	0.699091	0.159091	0.045455	0.045455		3	0.69359	0.69359	0.851563	0.148428			VG
4	DK717	0.920758	0.112636	0.990909	0.204545	0.090909			4	0.91455	0.923975	0.354688	0.144063	0.02125		MG
5	FM170	0.900689	0.112636	0.477273	0.295455	0.112636			5	0.908648	0.953145	0.53125	0.46575			MG
6	HMY920	0.916044	0.112636	0.990909	0.25	0.045455			6	0.806348	0.806348	0.742188	0.21875	0.02125		0.007813 VG
7	HNTY27	0.973204	0.002727	0.795455	0.181818				7	0.83245	0.83245	0.6875	0.226563	0.070213	0.007813	0.007813 VG
8	HQC609	0.822262	0.112636	0.5	0.295455	0.002727	0.045455	0.002727	8	0.50401	0.50401	0.859275				0.140625 VG
9	H907	0.999976	0.112636	0.477273	0.349091	0.002727	0.002727	0.002727	9	0.842599	0.842599	0.710928	0.164063	0.073125	0.023428	0.023428 VG
10	HY95	0.922255	0.112636	0.990909	0.204545	0.090909			10	0.904717	0.904717	0.720928	0.1875	0.0625	0.039063	VG
20	ZT193	0.950752	0.112636	0.681818	0.181818	0.002727			20.1	0.843213	0.799022	0.640625	0.325938	0.023428		MG
21	BM1980	0.938859	0.002727	0.704545	0.25		0.002727		21.1	0.888701	0.806581	0.15625	0.5	0.320213	0.023428	MG
21	BM4192	0.961568	0.002727	0.727273	0.25				21.2	0.87868	0.793444	0.710928	0.289063			MG
23	BM492	0.970135	0.002727	0.727273	0.25				23	0.228744	0.228744	0.875	0.125			VG
24	BY1288	0.959001	0.112636	0.981818	0.272727	0.045455			24	1	1	1				VG
25	CHY188	0.786818	0.112636	0.990909	0.227273	0.045455		0.002727	25	0.891054	0.891054	0.825928	0.109275	0.046875	0.007813	VG
26	CHY988	0.70625	0.112636	0.704545	0.112636	0.002727	0.002727	0.002727	26	0.801141	0.801141	0.825928	0.023428	0.109275	0.023428	0.007813 VG
37	CC21091	0.758221	0.090909	0.502727	0.295455	0.068182		0.002727	27	0.427152	0.427152	0.825928	0.02125	0.101563	0.02125	VG
38	DB1943	0.955108	0.090909	0.727273	0.183636	0.045455			28	0.905269	0.905269	0.825928	0.148428	0.015625		VG
39	DB240	0.960214	0.090909	0.704545	0.19091	0.045455		0.002727	29	0.970911	0.970911					0.063 VG
40	DB2818	0.788781	0.090909	0.349091	0.183636	0.159091		0.002727	40	0.976479	0.976479					0.023428 VG
41	DB8910	0.90851	0.090909	0.681818	0.183636	0.068182	0.002727		41	0.924288	0.924288			0.125	0.023428	VG
42	DD806	0.94822	0.112636	0.612636	0.25	0.002727			42	0.992923	0.992923			0.25	0.015625	VG
43	DD815	0.866225	0.112636	0.477273	0.272727	0.112636	0.002727		43	0.973567	0.973567			0.125		0.007813 VG
44	DU156	0.896447	0.112636	0				0.002727	44	0.783929	0.595929					0.063 VG
45	DK193	0.820979	0.112636	0				Mean最大值	45	0.75288	0.732779	0.854688	0.97656	0.49628	0.070548	0.019097 0.027244 VG
46	DK229	0.828848	0.112636	0				Min最小值	46	0.091141	0.091141	0.825928	0.023428	0.007813	0.007813	0.007813 VG
47	DK56	0.817329	0.112636	0												
127	ZR1	0.950971	0.112636	0												
128	ZT192	0.801209	0.112636	0												
Mean最大值		0.982119	0.112636	0.999091	0.272727	0.045455	0.090909									
Mean平均值		0.85757	0.097124	0.597656	0.280811	0.062711	0.020302									
Min最小值		0.543252	0.002727	0.349091	0.090909	0.002727	0.002727									

Max: 98%
Mean: 88%
Min: 54%

Max: 100%
Mean: 75%
Min: 9%

COYS

Results:

Distinctness: 8 of 8128 pairs have more than 95% coefficient of correlation; 142 of 8128 pairs have coefficient of correlation between 90% and 95%.

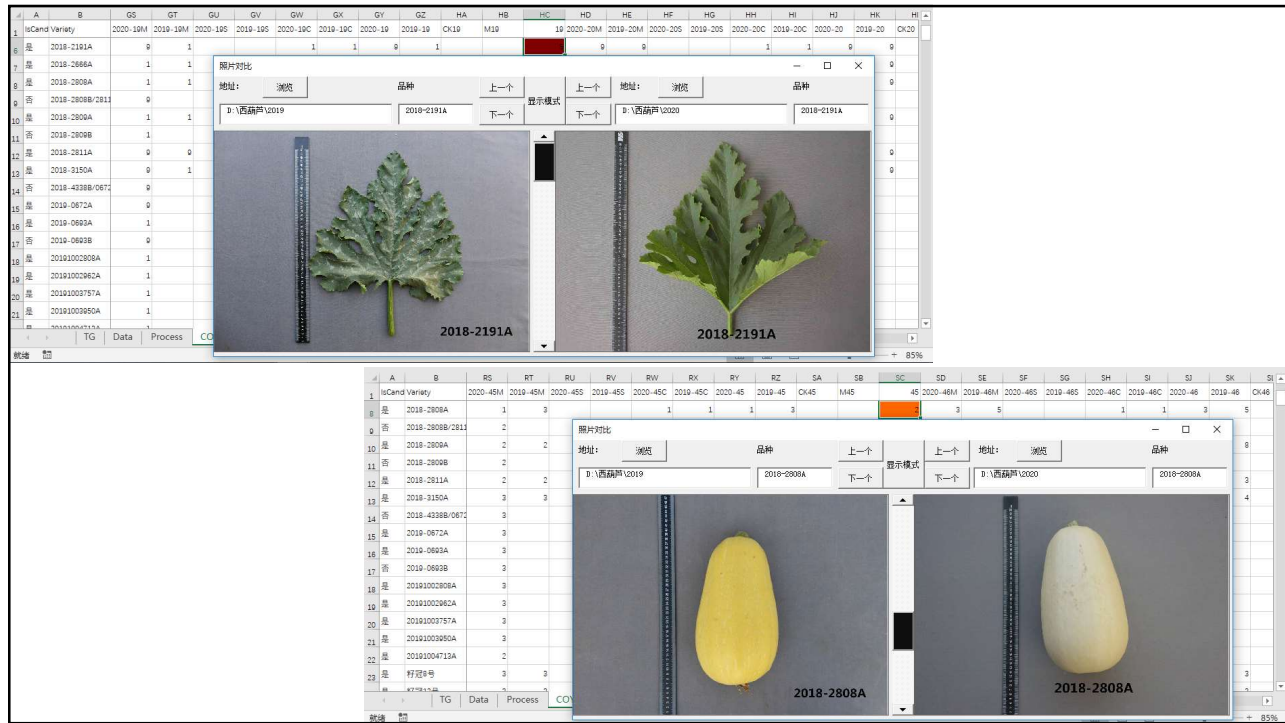
Stability:

cc of varieties between years

<60%	60-70%	70-80%	80-90%	>90%
5	6	12	22	83

cc of characteristics between years

<50%	50-60%	60-70%	70-80%	80-90%	90-100%	100%
4	3	4	8	14	9	1



SELECTION OF SIMILAR VARIETIES

	A	B	C	D	E	F	G	H	I	J	K	L	M		
1	Candidate	Variety		2	3	4	5	6	7	8	9	10	11		
125	TRUE	NKY328	2	2	3	5	6	3	4	1	1	2	6		
126	TRUE	YTN890	4	2	3	6	7	2	3	1	1	2	4		
127	TRUE	HTN800	4	2	2	6	7	2	4	9	1	1	5		
128	TRUE	NDT	4	2	2	4	5	2	4	9	2	8	6		
129	FALSE	MTN6	3	2	2	6	6	3	3	1	2	2	6		
130															
131		Correlation cc	JNC788	JK656	XD559	ZJ368	DT12	DK56	MC198	CHY188	CHY988	DD815	DJJ156		
132			JNC788	1	0.585	0.635	0.528	0.502	0.571	0.545	0.509	0.766	0.583	0.599	
133			HQC609	0.637	0.76	0.736	0.751	0.796	0.66	0.791	0.681	0.83	0.786	0.759	
134			JNT768	0.703	0.726	0.747	0.559	0.526	0.596	0.581	0.468	0.661	0.694	0.701	
135			MC838	0.613	0.852	0.886	0.804	0.653	0.886	0.712	0.707	0.79	0.894	0.796	
136			JK656	0.585	0.948	0.948	0.821	0.646	0.836	0.801	0.628	0.822	0.896	0.861	
137			XD559	0.635	0.948	0.948	1	0.776	0.632	0.785	0.626	0.831	0.9	0.862	
138			ZJ368	0.528	0.821	0.776	0.776	1	0.711	0.744	0.662	0.492	0.807	0.812	0.697
139			DT12	0.502	0.646	0.632	0.711	0.711	1	0.527	0.714	0.525	0.748	0.653	0.567
140			HM9820	0.586	0.831	0.839	0.872	0.652	0.81	0.651	0.5	0.861	0.886	0.766	
141			DK56	0.571	0.836	0.852	0.744	0.527	0.66	1	0.66	0.748	0.796	0.884	0.835
142			MC198	0.545	0.801	0.785	0.662	0.714	0.66	0.66	1	0.636	0.794	0.745	0.696
143			HY607	0.541	0.661	0.663	0.545	0.7	0.518	0.743	0.361	0.778	0.619	0.501	
144			JK995	0.589	0.881	0.9	0.774	0.626	0.892	0.724	0.642	0.821	0.923	0.867	

CC BETWEEN DIFFERENT METHODS

Correl	Different	-0.60651
Correl	Threshold	-0.77418
Correl	Euclidean	-0.94428
Different	Threshold	0.502822
Different	Euclidean	0.72022
Threshold	Euclidean	0.791977

ANALYSIS OF DISTINCTNESS—T TEST

The screenshot shows a large data table with columns labeled A through AF and rows numbered 1 through 48. The table contains numerical data, with many cells highlighted in red, indicating statistical significance or specific data points. The table is titled 'ANALYSIS OF DISTINCTNESS—T TEST'.

DIFFERENCE OF T TEST BY SINGLE YEARS AND COMBINED YEARS

count of different characteristics	count of first cycle	frequency of first cycle	count of second cycle	frequency of second cycle	count of combined cycles	rate of combined cycles
0	49	0.01	49	0.01	53	0.01
1	2	0	0	0	27	0.01
2	7	0	7	0	72	0.01
3	30	0.01	17	0	191	0.04
4	91	0.02	56	0.01	362	0.08
5	181	0.04	143	0.03	569	0.12
6	458	0.1	296	0.06	774	0.16
7	664	0.14	525	0.11	887	0.18
8	911	0.19	904	0.19	783	0.16
9	940	0.2	1070	0.22	580	0.12
10	810	0.17	971	0.2	355	0.07
11	487	0.1	576	0.12	131	0.03
12	172	0.04	188	0.04	18	0
total	4802	1.00	4802	1.00	4802	1.00

ANALYSIS OF DISTINCTNESS—COYD

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U
1	Candidate	Variety	4	4	5	5	17	17	18	18	19	19	20	20	23	23	24	24	26	26	27
125	TRUE	ZP1	80	80	81	81	47	47	55	55	55	55	55	55	55	55	55	55	55	55	55
126	TRUE	ZT192	54	58	55	58	38	41	53	53	53	53	53	53	53	53	53	53	53	53	53
130	Rows行数	129	7173	7359	7394	7553	4976	47	524	49	3987	895	2542	59	1782	05	1838	35	5922	04	9190
132	Columns列数	30																			
133	Varieties品种数	128	COYD	BM180	BM4192	BM492	BN1888	CH168	CH988	CC1081	DB1943	DB240	DB2916	DB6910	DC806	DD815	DD1556	DW193	DW239	DW56	DLH901
134	Candidate特征数	98	BM8458	11	13	11	6	6	6	7	10	7	8	8	8	6	6	5	8	5	7
135	Sample size样本数	2	CZ11912	8	6	7	7	6	5	2	3	4	4	4	4	6	11	9	7	7	4
136	Characteristics特征数	14	DB7915	6	6	6	7	6	4	9	8	8	8	8	7	4	4	5	6	4	1
137			DW7	10	12	12	5	3	4	5	2	4	4	4	4	4	4	4	4	4	4
138			FM170	11	4	3	7	7	6	6	5	8	6	6	6	11	6	11	11	8	6
139			HM9820	10	5	6	6	3	4	5	6	3	5	7	7	6	7	8	4	3	6
140			HN1727	6	3	3	9	3	10	6	7	10	9	10	11	12	10	11	9	8	6
141			HQ909	9	10	10	4	5	3	8	10	4	5	5	5	5	5	5	2	5	4
142			HY607	6	7	6	7	4	5	4	9	6	4	5	7	6	4	8	9	5	5
143			JK993	8	9	9	6	5	2	5	10	5	6	6	7	5	4	2	3	1	5
144			KN2000	13	9	10	6	6	7	10	8	9	8	10	8	8	7	10	9	9	7
145			KN7812	10	8	9	6	8	6	7	10	7	8	6	4	6	6	5	6	6	5
146			JN1805	9	6	6	5	5	4	10	7	6	4	5	6	7	6	6	7	4	3
147			JN788	6	5	7	9	8	8	8	6	8	9	9	9	12	9	11	10	11	3
148			JN288	9	6	7	5	5	5	4	5	4	4	7	4	6	5	4	7	7	7
149			KN219	12	7	7	4	5	4	7	4	5	9	7	6	6	6	7	9	6	6
150			KV9921	11	12	11	6	3	2	7	11	5	5	6	5	2	2	2	2	1	3
151			MCS9	10	11	10	5	2	2	2	2	2	2	2	2	2	2	2	2	1	1
152			MTH6	10	11	11	5	5	8	6	6	6	7	8	7	8	7	9	5	11	4
153			KN998	11	12	11	4	3	4	10	6	6	6	6	6	6	6	6	5	9	1
154			SB13	8	9	7	6	5	4	10	6	5	6	5	6	4	4	4	5	4	4
155			SD84	9	10	10	5	8	7	7	4	7	7	6	4	7	5	5	7	7	6
156			SDN80	11	10	9	4	7	5	5	4	4	6	6	7	8	7	9	9	8	6
157			SDT28	8	5	7	5	5	8	7	4	5	5	6	6	5	4	4	6	2	1
158			WZM127	11	8	8	8	8	10	6	4	6	6	6	6	11	10	10	11	10	7
159			XD7038	10	8	9	4	3	6	11	4	4	5	3	2	2	2	2	2	2	3
160			XY23	10	11	11	6	3	3	5	9	3	3	3	3	3	3	3	3	3	3
161			ZD998	10	9	8	4	3	3	4	4	4	5	5	4	6	4	7	7	4	5

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 color		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 coloration		5	6	1	5	6	1
11	Tassel: density of spikelets		5	5		5	5	
12	Tassel: intensity of anthocyanin coloration		1	1		1	1	
13	Tassel: intensity of anthocyanin coloration		5	5		5	5	
14	Tassel: intensity of anthocyanin coloration		1	1		1	1	
15	Tassel: angle between main axis and lateral branches		5	5		6	5	1
16	Tassel: curvature of lateral branches		1	1		1	1	
17	Tassel: length of main axis above lower node		37.9	43.66	5.76	41.22	45.015	3.795
18	Tassel: length of main axis above higher node		27.95	27.95		30.195	30.765	0.33933781
19	Tassel: number of primary lateral branches		12	15.35	3.34991-05	12.7	14.05	0.02186513
20	Tassel: length of lateral branches		24.075	27.05	2.97491-05	26.925	28.6	0.02608356
21	Stem: degree of zig-zag		1	1		1	1	
22	Stem: intensity of anthocyanin coloration		4	3	1	4	3	1



ANALYSIS OF UNIFORMITY

COYU

Candidate	Variety	17	17	17	17	18	18	18	18	19	19	19	19
ZD059		36.7	35.695	0.8327	1.02547	23.95	23.28	0.888624	0.984918	20.7	21.05	1.238940	0.981848
ZNT868		39.475	41	1.640852	0.957782	26.6	26.25	1.427659	1.00366	18.95	21.95	1.560741	1.462382
ZTL193		34.825	39.88	0.958986	1.045641	26.15	30.71	0.881759	0.873568	6.95	7.4	0.87319	0.716032
ANOVA	方差分析	39.2105	40.586	1.18784	1.171342	26.60433	27.61763	1.08855	1.051931	13.705	14.03667	1.121354	0.974902
df of trials	试验自由度	17	18	19	20	23	24	26.2	27.2	29.2	30.2	31.2	32.2
df of Error	误差自由度	1	1	1	1	1	1	1	1	1	1	1	1
MS of Error	误差均方	0.004083	0.020115	0.325288	0.022758	0.400328	0.262853	0.007815	0.003912	6.51E-05	0.012598	4.08E-05	0.001072
MS total	总自由度	1.590748	1.490878	1.305752	1.603525	2.289489	0.552762	2.067242	4.021212	0.003506	1.241247	0.115232	0.703248
MS total	总均方	1.603831	1.510993	1.631041	1.626283	2.689818	0.815614	2.975058	4.025124	0.003571	1.253845	0.115272	0.70432
Ucp		1.220821	1.110043	1.084973	1.226907	1.658170	0.481189	2.225248	2.431658	0.02035	0.688897	0.183014	0.893156
BMB458		1.108632	1.068683	1.078873	1.178706	1.595333	0.453357	2.159825	2.377125	0.030135	0.832758	0.150036	0.784363
CZ11912		1.307388	1.095878	1.055971	1.074774	1.631327	0.405427	2.074451	2.210134	0.025753	0.919305	0.177264	0.884637
DB7915		1.309854	1.096678	1.097218	1.05533	1.631327	0.405427	2.074451	2.210134	0.025753	0.919305	0.177264	0.884637
DK717		1.029694	0.807023	1.025729	0.963787	1.631042	0.383636	1.733326	2.401904	0.026588	0.594202	0.134143	0.76272
FM70		1.155161	0.955535	1.019079	1.026447	1.592866	0.260148	2.062009	2.423405	0.025252	0.141314	0.130365	0.746687
HM9820		1.040482	0.971654	0.889601	1.197437	1.575772	0.4112	1.985673	2.10798	0.024272	0.648422	0.148204	0.904021
HNTY27		1.182063	1.02	1.201558	1.298676	1.426864	0.431707	2.370336	2.276269	0.041571	0.436728	0.214361	0.938236
HQC609		1.234146	1.168968	1.081863	1.146598	1.963991	0.320586	1.972156	2.439906	0.022401	0.582044	0.171601	0.821784
HY607		1.301777	1.241351	1.044701	1.155569	1.60189	0.458007	1.900585	2.361005	0.027923	0.776333	0.124126	0.847147
JK905		1.209561	1.100821	1.161978	1.268529	1.461554	0.358891	1.975802	2.314541	0.016011	0.989796	0.134026	0.830446
JKN2000		1.090554	1.05002	0.766357	0.981218	1.02485	0.346139	1.998293	2.030355	0.017727	0.662454	0.182107	0.869632
JKT633		1.185092	0.852084	0.928009	1.017957	1.570704	0.367254	2.225157	2.305102	0.02918	0.626663	0.157598	0.869651
JN1805		1.052544	0.958573	1.011903	1.181708	1.258362	0.320968	1.944488	2.3224	0.031706	0.868554	0.139214	0.874236
JNT768		1.153611	1.089552	1.09448	1.203089	1.522362	0.477838	2.360739	2.461908	0.039933	0.606157	0.17865	0.858017



Off-type

Candidate	Variety	Sample size	Offtypes	U-1
测	品种	总株数-1	异型株数-1	
TRUE	A	40	3	U
FALSE	B	40	4	NU
FALSE	C	100	5	U
FALSE	D	100	6	U
FALSE	E	120	7	U
FALSE	F	120	8	NU

Relative Variance

	A	B	RO	RP	RQ	RR	RS	RT	RU
1	Candidate	Variety	2019-175D	2019-17Re	2019-17Ur	2020-17SD	2020-17Re	2020-17Ur	
2	FALSE	BMB458	1.785173	20	2.942877	20			
3	FALSE	CZ11912	3.189843	20	2.969065	20			
4	FALSE	DB7915	2.979756	20	3.297603	20			
5	FALSE	DK717	1.858857	20	1.756072	20			
6	FALSE	FM70	2.230766	20	1.978909	20			
7	FALSE	HM9820	1.1940564	20	1.612745	20			
8	FALSE	HNTY27	2.022895	20	2.018826	20			
9	FALSE	HQC609	2.211662	20	2.701827	20			
10	FALSE	HY607	3.446585	20	2.816138	20			
11	FALSE	JK905	2.697943	20	2.308816	20			
12	FALSE	JKN2000	2.765939	20	1.304839	20			
13	FALSE	JKT633	2.451637	20	2.198325	20			
14	FALSE	JN1805	1.90498	20	1.940808	20			
15	FALSE	JNT768	2.21404	20	1.953533	20			
16	FALSE	JKN386	3.218323	20	1.864763	20			
17	FALSE	JZN219	2.523573	20	2.759165	20			

CHECKING AND RENAMING PHOTO FILES

	A	B	C	D	E	F
	OldName	Type	Address	NewName	Photo1	Photo2
1	1.jpg	文件	D:\西葫芦\2020\2017-0971A			
2	2.jpg	文件	D:\西葫芦\2020\2017-0971A			
3	3.jpg	文件	D:\西葫芦\2020\2017-0971A			
4	4.jpg	文件	D:\西葫芦\2020\2017-0971A			

VERIFICATION OF CHARACTERISTICS AND TRIAL

Estimate sample size by normal data

Estimation of sample size for normal data 常规数据样本含量估计

显著水平

标准差

Δ均值差

错误

Default 默认值

Est. of Population Mean 总体均值估计

Est. of two sample mean 两样本均值差估算

Power est. of Population Mean 总体均值带功效估计

Power Est. of two sample mean 两样本均值差带功效估算

Minimum sample size 最小样本容量

Estimate sample size by rate data

Estimation of sample size for percentage value 百分率数据样本容量估计

显著水准 α

处理1百分率 p_1

处理2百分率 p_2

百分率差 Δ

错误 β

Default 默认值

Est. of total percentage 总体百分率估算

Power est. of total percentage 总体百分率带功效估计

Minimum sample size 最小样本容量

APPLICATION IN MAIZE

- 2 years, 2019-2020
- 44 Characteristics, including 4 for sweet corn only, 1 for pop corn only, including 30 VGs, 2 MGs, 12 MSs.
- 128 varieties, including 98 candidate and 30 similar varieties, including 82 sweet corn varieties, 12 pop corn varieties.

DISCUSSIONS

- Different methods have different result, how to harmonized analytical methods between UPOV members?
- Do we need same Minimum Distance standard between candidate and similar varieties for D, or normal plants and off-types for U, or two samples for S?
- Visual observation method and note are economic but have low accuracy and always cause a lot of errors. Is it time to replace them by Measure method or taking photos?
- Two varieties have significant but not same direction difference in QN characteristics, are they distinct or not ?

PLANS

◆ Applying Image Analysis System in DUS testing.



◆ Developing a big data platform for DUS testing.



THANK YOU FOR YOUR ATTENTION!

Yang Kun
yangkun@caas.cn
+86-10-8210 5623
+86-(0)1391 1259 308