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VARIATION IN MOVING AVERAGE PROCEDURE IN COY-U

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1. Introduction

To estimate the relationship between standard deviation (SD) and arithmetic mean a 9-point moving average (MA-9) is calculated using the COY-U procedure. The method is described in TGP/10.3.1 Draft 3 (see chapter “Mathematical Details”). For each reference variety the average of log SDs ($\log(\text{SD}+1)$) of the variety and the four varieties on both sides are the basis of MA-9. At the extremes this average is based on the mean of 3, 5 or 7 values (MA-3, MA-5 and MA-7, respectively).

In a further step, the so-called trend values for candidate varieties have to be estimated by using the linear interpolation between trend values of the nearest two reference varieties.

The aim of this paper is to show the influence of choosing an MA-9 on the results of the COY-U procedure. Alternatives are possible by using more or less reference varieties on either side (20, 10, 6 or 2 instead of 4).

What was the reason to vary this part of the procedure?

The main reason to check the moving average procedure within COY-U was that some crop experts considered that the increasing number of reference varieties had an influence on the effect of calculated moving averages. In cases with a high number of reference varieties, the SD of a candidate will be adjusted only by very close varieties (close in respect of characteristic mean). From the experts' point of view, additional varieties would be comparable and the selected reference varieties might be the closest on the basis of chance. It was expected that the adjustment would be more stable with a moving average over more than 9 varieties (e.g. MA-13, MA-21 or MA-41).

2. Example to demonstrate the procedure

An example to demonstrate the procedure is given in Table 1. It is the same example as given in Table 2 of TGP/10.3.1 Draft 3.

Table 1: Example data set calculating different trend values

Variety	Ranked mean	Log (SD+1)	Log (SD+1)		
			7-point	9-point	11-point
R1	38	2.25			2.25
R2	63	2.21		2.21	2.21
R3	69	2.39	2.39	2.39	2.39
R5	69	2.50	2.50	2.50	2.50
R4	71	2.42	2.42	2.42	2.42
R6	74	2.38	2.38	2.38	2.38
R8	75	2.48	2.48	2.48	2.48
R7	76	2.46	2.46	2.46	2.46
R11	76	2.32	2.32	2.32	2.32
R9	78	2.53		2.53	2.53
R10	79	2.34			2.34
Sum			16.95 /7	21.69 /9	26.28 /11
Trend value for variety R6			2.42	2.41	2.39

Varieties are ordered by arithmetic means. Three trend values for 7-, 9- and 11-point moving averages are calculated for variety R6. The MA-9 for R6 (2.41) is the same as in Table 2 of TGP/10.3.1 Draft 3. The differences between the three calculated trend values in this example are very small and might not be representative for the problem we have in cases with more than one hundred reference varieties (for example in rape seed). However, the example was chosen to demonstrate the differences in procedure.

3. Influence of variation of moving average procedure on COY-U results for a rape seed example

Winter oilseed rape data from three years (2001-2003), 276 reference varieties, 143 candidates and 18 characteristics were checked by calculation of different moving averages (MA-5, MA-9, MA-13, MA-21 and MA-41) and by the application of the COY-U procedure. Results for UPOV characteristics 14 and 17 in TG/36/6 Corr. (Flower: width of petals, and Plant: total length including side branches) are included in Table 2.

Table 2: Significance statements for uniformity of rape seed varieties in characteristic 14 “Flower: width of petals” and characteristic 17 “Plant: total length including side branches” (TG/36/6 Corr.).

Characteristic number	Variety	MA-5	MA-9	MA-13	MA-21	MA-41
14	A					*
14	B	:				
14	C	:				
14	D		*		*	
14	E		:	:	:	:
14	F	*				
14	G		*	*	*	*
14	H			*	*	*
14	I	*		*	*	
17	J	+	+	+	:	:
17	K	:	+	:	:	:
17	L			:	:	:
17	M	:				
17	N	:				
17	O	+	:	:	:	:
17	P	*				
17	Q		*	*	*	*
17	R	*	*		*	*

Symbols are used in the same manner as in TGP/10.3.1 Draft 3:

- * SD exceeds over-year uniformity criterion after 3 years ($p_{u3}=0.002$)
 - + SD exceeds over-year uniformity criterion after 2 years ($p_{u2}=0.02$)
 - :
- SD not yet acceptable on over years criterion after 2 years ($p_{u2}=0.02$; $p_{nu2}=0.002$)

Only the varieties which do not have the same information in columns 3 to 7 are shown in Table 2. In only 1.8% of all comparisons between the different types of moving averages is there a different statement regarding the COY-U criterion. It is obvious that the MA-5 and MA-41 cases can lead to different results. If the standard case MA-9 is compared with case MA-13, only 0.5% of all possible comparisons have different COY-U results. The effect was much smaller than expected by crop experts.

4. Influence of variation of moving average procedure on COY-U results for a hybrid ryegrass example

Hybrid ryegrass data from three years (2001-2003), 21 reference varieties, 7 candidates and several characteristics were checked by calculation of different moving averages (MA-5, MA-9, MA-13, MA-21 and MA-41) and by the application of the COY-U procedure. The different moving averages led to the same result in all possible comparisons. The reason for this effect was the small number of reference varieties. This means there is no need to change the procedure in this case.

5. Influence of variation of moving average procedure on COY-U results for a red clover example

Red clover data from three years (2001-2003), 66 reference varieties, 3 candidates and 15 characteristics were checked by calculation of different moving averages (MA-5, MA-9, MA-13, MA-21 and MA-41) and by the application of the COY-U procedure. Results for the UPOV characteristics 11 and 13 (Time of flowering, and Stem: thickness) in TG/5/7 are included in Table 3.

Table 3: Significance statements for uniformity of red clover varieties in characteristic 11 “Time of flowering” and characteristic 13 “Stem: thickness” (TG/5/7).

Characteristic number	Variety	MA-5	MA-9	MA-13	MA-21	MA-41
11	A		*			
11	B	*	*			
13	C	*				
13	D	+	:	:	:	:
13	E		*			

Symbols are used in the same manner as in TGP/10.3.1 Draft 3:

- * SD exceeds over-year uniformity criterion after 3 years ($p_{u3}=0.002$)
- + SD exceeds over-year uniformity criterion after 2 years ($p_{u2}=0.02$)
- : SD not yet acceptable on over years criterion after 2 years ($p_{u2}=0.02$; $p_{nu2}=0.002$)

Only the varieties which do not have the same information in columns 3 to 7 are shown in Table 3. In only 1.4% of all comparisons between the different types of moving averages is there a different statement regarding to the COY-U criterion. It is obvious that the MA-5 and MA-41 cases can lead to different results. If the standard case MA-9 is compared with case MA-13, only 0.7% of all possible comparisons have different COY-U results. The effect was, again, much smaller than expected by crop experts.

6. Conclusion

The expected high influence of different types of moving averages on the results of the COY-U procedure was not seen. The moving average of MA-9 provides very stable results compared to the other tested cases.

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