

**TWA/30/16****ORIGINAL:** English**DATE:** August 28, 2001

INTERNATIONAL UNION FOR THE PROTECTION OF NEW VARIETIES OF PLANTS
GENEVA

**TECHNICAL WORKING PARTY
FOR
AGRICULTURAL CROPS**

**Thirtieth Session
Texcoco, Mexico, September 3 to 7, 2001**

QUESTIONNAIRE ON HARMONIZATION OF DESCRIPTIONS OF BARLEY

Document prepared by experts from Denmark

QUESTIONNAIRE ON HARMONIZATION OF DESCRIPTIONS OF BARLEY

At the TWA meeting 2000 it was decided to continue the work in relation to the management of the variety collections. One of the factors concerned was the plant variety description and the environmental effects on the states of expression of different morphological characteristics.

The aim of the questionnaire is to analyse the interaction between variety and environment on the individual characteristics. The summary of the questionnaire is intended to form the basis for discussion on how to use the descriptions produced under different environmental conditions in the DUS-testing (pre-screening).

Information on the expert who answers this questionnaire

Country	Name of answering person:	Address
AR	MARCELO LABARTA	AV. PASEO COLÓN 922 – 3° OF. N° 347 (1063) CAPITAL FEDERAL
AT	Fürnweiger Barbara	Bundesamt und Forschungszentrum für Landwirtschaft Spargelfeldstraße 191 -1226 Wien
CH	R. Guy	Station fédérale de Changins, CP 254, CH-1260 Nyon 1
CO	Jorge Enrique Suarez C.	Proteccion Obentores Bogata
CZ	Jirí Soucek	Central Institute for Supervising and Testing in Agriculture, Plant Variety Testing Division, Department of Plant Variety Rights and DUS Tests, Za opravnou 4, 150 06 Praha 5 - Motol, Czech Republic
DE	Beate Rücker	Bundessortenamt, Osterfelddamm 80, 30627 Hannover
DK	Erik Lawaetz	Department of Variety Testing, Postbox 7, Teglværksvej 10, DK-4320 Skælskør
EE	Pille Ardel	Plant Production Inspectorate, Variety Control Department, 71024 Viljandi
	Tiiia Tõnisson	Variety Testing Centre of Viljandi, 71024 Viljandi, Estonia
FR	Caroline Colnenne	GEVES : La Minière, 78285 Guyancourt Cedex France
IR	Gordon Rennick	Office of the Controller of Plant Breeder's Rights, Department of Agriculture, Food and Rural Development, National Crop Research Centre, Backweaton, Leixlip, Co. Kildare, Ireland
JA	Toshiharu Shimazaki	Examiner, Seeds & seedlings Division, MAFF, Japan
NO	Marit Moe	Nor. Agr. Insp. Service, P.O.B. 3, N-1431 Ås
NZ	Phil Rhodes	Plant Variety Rights Office, PO Box 130, Lincoln, New Zealand
RU	Mrs. Tatiana Makeeva	STATE COMMISSION OF THE RUSSIAN FEDERATION FOR SELECTION ACHIEVEMENTS TEST AND PROTECTION, 1/11 ORLICOV PER. MOSCOW 107139 RU
SA	Mrs. Joan Sadie	Directorate Genetic Resources, National <department of Agriculture, Private Bag X5044, Stellenbosch 7599, South Africa
SL	Katarína Benovská	Central Agricultural Controlling and Testing Institute, Matúškova 21, 833 16 Bratislava, SLOVAKIA
UK	Bob Jarman	NIAB, Huntingdon Road Cambridge, CB3 3DD, UK

Q1. Does your testing authority produce morphological descriptions of varieties of spring barley?

Yes, please proceed to Question 2.

AT, CZ, DE, DK, FR, JA, NO, NZ, RU, SA, UK, EE, SL

No, please explain briefly the use and handling of descriptions received from different countries (in the case of granting plant breeders' rights) for varieties of spring barley (max 4-5 lines).

AR, CH, IR

AR	The descriptions are given by the applicant/breeder. The official authority filed these descriptions in a database program for distinctness evaluation (screening operation). If as results of the study, the candidate variety is similar to another the Office requests more information. In some cases the expert goes to the breeder's trials to verify characteristics or conduct specific trials.
CH	We adopt the conclusions about DUS and the description of the variety. We translate it into French or German if necessary.
IR	We have no DUS testing of cereals in this country. Most of the morphological descriptions we deal with are from the one source in the UK.
JA	We have a few registered varieties for spring barley. Therefore the reply to the questions is far from satisfactory.
SA	We produce morphological descriptions for the barley varieties tested in our field trials each year (official testing authority).

Q2. Please explain the main difficulties encountered using descriptions made by other countries. Furthermore, please state the precautions taken to overcome these problems.

AT	Sometimes Time of ear emergence and plant length do not harmonize with the Austrian data. We check the material by ourselves and compare them.
CZ	We do not have a practical experience resulting from use of variety descriptions of barley made by other countries. Nevertheless, we could assume some difficulties in accepting morphological descriptions of varieties of spring barley made under very different environmental conditions.
DE	From descriptions made by other countries only grouping characteristics are used for managing the growing trial. - No problem with that. Our certification people have sometimes problems especially with plant length and time of ear emergence. In that case they get a national description from us. (Fore these characters agreement is better with DK and NL than with UK and F).
DK	Not using the same (updated) Guideline Not using the same method converting quantitative characteristics to scores Not all example varieties are available. Different climate conditions in other countries (bilateral agreements) can/may influence the expression of some characteristics in the descriptions. Precautions taken to overcome these problems: Exchange of experience and methods in doing the DUS-testing
FR	The main difficulty is to agree with the evaluation of the state of expression of the character . Differences because :pedo climatic conditions variability leads to differences of the character state expression (not in the same scale extension). In certain countries, the variability covers only a part of the UPOV scale and changes in the rank of variety are frequently observed. - measurements have been realised by different persons. An other important difficulty is a different understanding of the characteristics or of the way of assessment of it. Precautions taken: new varieties are systematically described under France conditions during two years.
NO	Comparing time of ear emergence, and intensity of anthocyanin coloration on auricles, awns and nerves of lemma. Relating foreign and Norwegian results while facit of the foreign is known.
NZ	We do not use descriptions made by other countries as we are unsure as to how useful they would be in our situation, where the environment is quite different to other regions of the world (esp.Europe).
UK	Availability and access to variety descriptions. Effects of local environment on the expression of certain characters such as the degree of expression of anthocyanin pigment in spring barley. Varieties may be grown in field plots in the UK and characters recorded under UK conditions and compared with the original description; adjustments may be made to the description to suit UK conditions before storing in our data base.
EE	1. In some characteristics we have seen different expressions in Estonia 2. It is difficult to get good post control result on descriptions if standard sample is not available. 3. The short growing season makes some differences in length and heading time.

Q3. Method for producing the official variety description.

The variety descriptions are produced by the national authority based on their field trials enabling a direct comparison between all varieties included in the national variety collection.

AT, CZ, DE, DK, FR*, NO, NZ, RU, SA, UK, EE, SL

FR* All national variety collection is not systematically sown every year. Some comparisons are made on descriptions in database including only French descriptions.

In case of more than one trial site, please indicate the way of selecting the trial site responsible for the variety description?

DE	The crop expert produces the description from "his" trial side (first location). If the variety is not DUS at this site but at the second location, the description is made with results from the second location.
FR	We have two DUS sites. We don't select one of them for the variety description. We use the two locations by two years (= 4 descriptions) to produce the final description. The crop examiner decides which note is the most suitable to describe the variety.
SA	Usually only one growing cycle is used to produce the final official variety description.

The descriptions are produced by the national authority based on the applicant's trial results (breeders' testing).

Q3. (cont.)

How many different trial sites are handled nationally?

[x] The descriptions are generated by the applicant based on his own trial results (breeders' testing).

How many different trial sites are handled nationally?

AR
1 - 3

In case of breeders' testing, please explain briefly which technical precautions are taken to ensure harmonized morphological variety descriptions from different testing sites?

AR	The National Table of characteristics includes asterisked characteristics of UPOV Guidelines. We take into account qualitative characteristics principally. Quantitative characteristics are only used if we have statistical analysis in the same testing site.
----	--

	AR	AT	CZ	DE	DK	FR	NO	NZ	RU	UK	EE	SL	
How many independent growing cycles are required to produce a final official variety description?	3 - 2	2 - 3	2	2	2	4	2	2	2	2	2	2	
Is it possible to change/modify the description once the final description has been produced?	No	No	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	No	No	

In case of yes, please indicate the reasons for possible modification

CZ	A supplementary description (of new characteristics) may be produced in case of a basic change of tables of characteristics. In principle, such description does not replace the original one.
DE	Only in case of essential modifications in a revised Technical Guideline a new description is produced for old varieties.
DK	Mistakes
FR	Revision of guidelines Mistakes New range of variability
NZ	Only if a mistake had been made in the description.
RU	In case if reasoned doubts in correctness of a variety description appear there will be executed an additional trial upon control sample.
UK	Although the answer to the above was "Yes" in practice this is very rarely done and only if there is an obvious error.

Q4. Please send the morphological variety descriptions of the following varieties:

ALEXIS	CHALICE	MAGDA	PRESTIGE
ANNABELL	CHARIOT	MARESI	PRISMA
APEX	CSBA51382	MAUD	RIVIERA
ARAMIR	DERKADO	MELTAN	SALOON
ASPEN	EUNOVA	OHARA	SCARLETT
ATEM	EXTRACT	OPTIC	SIRIUS
BARKE	GOLF	ORTHEGA	STEFFI
BARONESSE	HANKA	OTIRA	TANKARD
BONAIRE	KRONA	OTIS	THURINGIA
BRENDA	LANDORA	PENELOPE	VISKOSA
BRITTA	MADONNA	PONGO	VOLGA

The varieties have been selected according to the questionnaire on barley varieties presented in the paper TWA/29/19. These varieties are/have been included in DUS tests by several member States.

The descriptions should be sent in electronic format (preferably Excel) with the following information (columns and column headings):

- Country submitting the information identification country
- Reference to the guidelines used gl
- Variety identification (denomination in uppercase) var_id
- Testing period test_period
- DUS country (e.g. bilateral agreements) DUS_country
- Testing location tst_location
- Characteristic number (UPOV: 1-n; National 101-n) char_no
- Character description (English) char_desc
- Scale used (e.g. 1-9) scale
- State of expression expression

For each testing location, please indicate:

- Altitude altitude
- Average sowing date sow_date
- Average growing period in days (sowing to harvest) grow_period
- Average rainfall (in the growing period) avg_rainfall
- Possibility of irrigation (Y/N) irrigation
- Average daytime temperature at heading stage avg_temp_daytime
- Average night-time temperature at heading stage avg_temp_nighttime
- Soil type (sandy, loamy-sand, sandy-loam or clay) soiltype
- Average nitrogen application N_application
- Average plant density plant_density
- Use of herbicides (Y/N) herbicides
- Use of fungicides (Y/N) fungicides
- Use of insecticides (Y/N) insecticides
- Other specific growing conditions or restrictions spec_grow_conditions

The information will be used in relation only to this questionnaire and treated confidentially (especially data about country and testing locations).

Question 4

Question 4 has been answered by 10 member states (Table 1). The number of varieties submitted varied from 2 to 42. In total 174 descriptions of 43 different barley varieties are included in the following analysis.

Within every variety the years of testing vary between testing sites. Varieties have been in testing from 1973 to 2000. Some varieties are described after one year of testing (2000). Therefore the variation between testing sites is influenced by the years of testing.

In total 4814 states of expressions coming from 174 descriptions with maximum 29 characteristics have been received (in theory 5046 states of expressions). The difference between the theoretical number of states of expression and the number received is due to the fact that not all varieties are fully described according to TG/19/10. For this reason the dataset is to a minor extent unbalanced within each variety (1-4814/5046 equating 4.6%).

Table 1 and 2 give an overall picture of the varieties included in the analysis. Variety ‘CSBA 5138-5’ has only been submitted by one country. As this survey evaluates the harmonization of the descriptions between testing offices ‘CSBA 5138’ is eliminated.

From the variety ‘Scarlett’ descriptions from 7 testing offices have been received. ‘Barke’, ‘Thuringia’, ‘Alexis’, ‘Annabell’ and ‘Hanka’ have all been described by 6 testing offices. Descriptions according to TG/19/7 have been converted into a TG/19/10 by renumbering the characteristics in accordance with TG/19/7. Characteristics from TG/19/7 not included in TG/19/10 have been eliminated. National characteristics used to describe the individual varieties are not included in this analysis.

Table 1: Number of descriptions included in the survey

Country		No of descriptions
AR	Argentina	4
AT	Austria	10
CZ	Czech Republic	15
DE	Germany	28
DK	Denmark	42
EE	Estonia	13
FR	France	38
NZ	New Zealand	2
SK	Slovakia	12
UK	United Kingdom	10

Table 2: Number of descriptions included in the survey

No	Varieties
1	CSBA 5138-5
2	LANDORA, PONGO, OTIRA
3	OPTIC, MAUD, CHALICE, BRITTA, CHARIOT, OHARA, VOLGA, RIVIERA, ARAMIR, BONAIRE, TANKARD, STEFFI, OTIS, ASPEN
4	DERKADO, ATEM, MAGDA, BRENDA, KRONA, EUNOVA, PENELOPE
5	APEX, ORTHEGA, MELTAN, MARESI, MADONNA, VISKOSA, GOLF, SALOON, PRISMA, BARONESSE, EXTRACT, PRESTIGE
6	BARKE, THURINGIA, ALEXIS, ANNABELL, HANKA
7	SCARLETT
Σ	43 varieties with in total 174 descriptions

Unfortunately most descriptions have been received from European countries. Outside Europe only New Zealand and Argentina have submitted descriptions.

Table 3 shows a comparison of the descriptions of the variety 'Alexis' elaborated by 6 member states. To estimate the variation between descriptions the standard deviation (STD) is used as response variable or indicator.

$$STD = \sqrt{\frac{1}{n-1} \sum_{x=1-n} (x_x - \bar{x})^2}$$

All grouping characteristics (2, 8, 13, 22, 26 and 29) are described with the same state of expression by all member states (STD=0). Between the other morphological characteristics of 'Alexis' the STD varies from 0.4 to 2.3. Roughly a STD of 1 covers a variation of 2 to 3 states of expression. With a value of 1.5 the STD shows a difference of 3 to 5 states of expression and at a value of 2 or more the characteristic in question has a variation of at least 5 to 6 states of expression. In relation to the descriptions of 'Alexis' the level of the STD varies independently of whether the characteristic has an * or not.

Table 3: Comparison of morphological description of 'Alexis' elaborated by 6 different countries according to TG/19/10

			Scal e	CZ	DE	DK	FR	SK	UK	ST D
2	*-g	Lowest leaves: hairiness of leaf sheats	1,9	1	1	1	1	1	1	0.0
8	*-g	Awns: anthocyanin coloration of tips	1,9	9	9	9	9	9	9	0.0
13	*-g	Ear: number of rows	1,2	1	1	1	1	1	1	0.0
22	*-g	Grain: rachilla hair type	1,2	2	2	2	2	2	2	0.0
26	*-g	Grain: hairiness of ventral furrow	1,2	1	1	1	1	1	1	0.0
29	*-g	Seasonal type	1,2,3	3	3	3	3	.	3	0.0
1	*	Plant: growth habit	1-9	5	6	5	5	5	5	0.4
3	*	Flag leaf: anthocyanin coloration of auricles	1-9	9	9	9	9	9	9	0.0
4	*	Flag leaf: intensity of anthocyanin coloration of auricles	1-9	4	6	6	7	5	5	1.0
7	*	Time of ear emergence	1-9	5	6	6	.	5	3	1.1
9	*	Awns: intensity of anthocyanin coloration of tips	1-9	2	4	6	4	5	7	1.8
10	*	Ear: glaucosity	1-9	4	1	6	6	5	5	1.9
12	*	Plant: length (stem, ear and awns)	1-9	7	5	5	.	.	4	1.3
15	*	Ear: density	1-9	5	5	5	5	5	4	0.4
17	*	Awn: length (compared to ear)	3,5,7	5	3	7	5	7	7	1.6
20	*	Sterile spikelet: attitude	1,2,3	2	2	3	3	3	3	0.5
23	*	Grain: husk	1,9	9	9	9	9	9	9	0.0
5		Plant: frequency of plants with recurved flag leaves	1-9	6	4	6	5	1	1	2.3
6		Flag leaf: glaucosity of sheath	1-9	7	4	8	7	7	6	1.4
11		Ear: attitude	1-9	2	6	7	5	3	5	1.9
14		Ear: shape	3,5,7	5	.	5	5	5	5	0.0
16		Ear: length (excluding awns)	1-9	5	.	5	6	5	6	0.5
18		Rachis: length of first segment	3,5,7	5	.	4	4	.	3	0.8
19		Rachis: curvature of first segment	1-9	3	.	3	3	3	7	1.8
21		Median spikelet: length of glume and its awn relative to grain	1,2,3	2	3	2	2	2	2	0.4
24		Grain: anthocyanin coloration of nerves of lemma	1-9	5	5	7	3	5	5	1.2
25		Grain: spiculation of inner lateral nerves of dorsal side of lemma	1-9	1	1	1	1	1	1	0.0
27		Grain: disposition of lodicules	1,2	2	.	2	2	.	2	0.0
28		Grain: color of aleurone layer	1,2,3	1	1	1	1	1	1	0.0

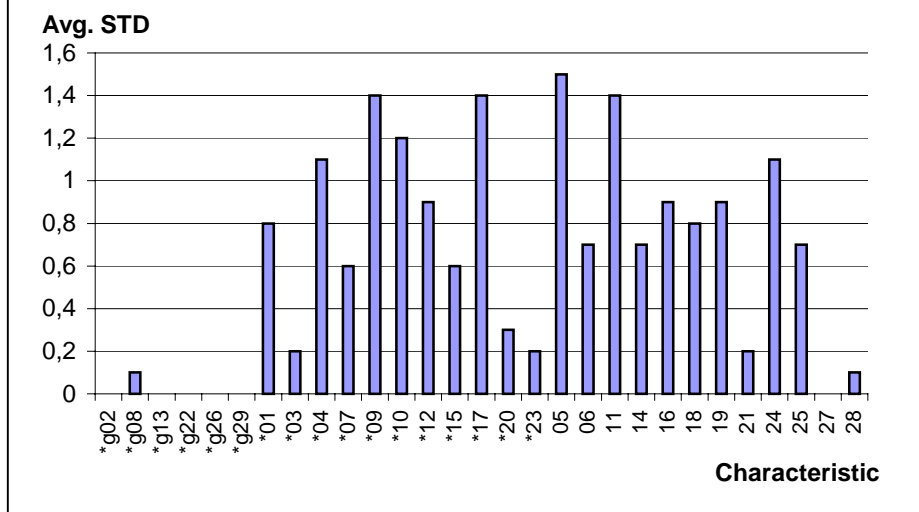
In Annex 1, a complete overview of the STD between the states of expression given by the testing offices of each characteristic within each variety is shown. A minor extract is shown in Table 4 where the grouping characteristics combined with a selection of varieties are shown. Within these varieties the grouping characteristics do not have a harmonized expression. The variation comes from characteristics 2 and 22: 'Maud' and 8: 'Thuringia'. Concerning 'Maud', Lowest leaves: hairiness of leaf sheats, 3 descriptions are evaluated. 2 countries have submitted the state of expression 1 and one country the state of expression 2. As characteristic 2 is stated either 1 or 9. The problem is regarded as a typing error. Regarding characteristic 22: Grain: rachilla hair type, 2 testing offices describe the rachilla hair of 'Maud' to be long and one country the hair type as short.

Table 4: Extract of Annex 1. Average standard deviation of selected characteristics and varieties

	2	8	9	22	26	29	No
var_id	*g	*g	*	*g	*g	*g	
MAUD	0.6	0.0	0.7	0.6	0.0	0.0	3
THURINGIA	0.0	3.2	0.7	0.0	0.0	0.0	6

In relation to 'Thuringia' 6 countries have given their descriptions. 5 countries have given character 8 (Awns anthocyanin coloration of tips (1 or 9)) the note 9 (present) and one country the note 1. The countries, which gave the note 9, have given notes from 1 to 3 for character 9 (Awns: Intensity of anthocyanin coloration of tips (1-9)). The standard deviation of the characteristic 9 'Thuringia' is low compared to the other varieties. A difference in an absent/present characteristic is not necessarily expressing a clear difference if e.g. the presence of anthocyan is further described.

Figure 1: Characteristics of TG/19/10 - average standard deviation of the state of expression per characteristic per variety between member states



The average STD across all varieties of all characteristics is shown in figure 1.

The characteristics 4*, 5, 9*, 10*, 11, 17* and 24 have the highest variation between the states of expression given by the different testing offices. The displayed average STD covers a variation between 42 varieties. Therefore further investigations have to be done on the full set of data given in Annex 1.

Evaluating and drawing any conclusions based on the information given in Annex 1 is a difficult task. To ease this difficulty the STD is grouped on a scale from 0 to 5.5 with an interval of .5. The number of cases (varieties*characteristic) where the STD falls in one of the intervals is counted and the results are presented in Table 5.

From the received descriptions of 'Alexis' 12 characters have a STD of .25 or less, 5 characters have a STD between .25 and .75, 4 characters have a STD between .75 and 1.25, 3

characters have a STD between 1.25 and 1.75, 4 characters have a STD between 1.75 and 2.25 and 1 character has a STD between 2.25 and 2.75.

From all received descriptions 756 combinations of variety and characteristic have a harmonized expression between testing offices (STD <0.75).

Characters having a STD between testing offices of 1.5 or more are considered to have a high variation between testing offices (206 combinations of 1163 equating 18%). Characters with a STD of about 1 are susceptible to environmental influence, but with a variation of 2 to 3 states of expression they are considered to be acceptably harmonized (201 combinations of 1163 equating 18%).

In Table 5 it is possible to evaluate the stability of the individual varieties across testing sites. Table 5 is sorted according to the number of descriptions received and the number of characteristics within a STD of less than 0.25. 'Aramir', 'Chalice' 'Pongo' have a high number of harmonized expressions of morphological characteristics across testing sites. Increasing the number of testing sites shows an increasing number of characteristics with an higher variation in the states of expression within the same variety. 'Landora' has been described by 2 testing offices in relation to character 3 (Flag leaf: Anthocyanin coloration of tips). One country describes 'Landora' to have anthocyanin

Table 5: Number of STD falling within the span of 0.5

	0	0.5	1	1.5	2	2.5	3	3.5	4	5	5.5	Σ	Varieties
PONGO	19	5	1	3	1							29	2
OTIRA	15	3	1	5	2							26	2
LANDORA	9	4		2							1	16	2
CHALICE	18	5	3	1	1	1						29	3
ARAMIR	17	3	5	1		1		1				28	3
OPTIC	16	6	4	2			1					29	3
TANKARD	16	5	5	2	1							29	3
RIVIERA	16	3	2	1	2	1	2					27	3
OHARA	14	4	3	3	1							25	3
BRITTA	13	10	1	3								27	3
ASPEN	12	6	7	3	1							29	3
BONAIRE	12	7	4	3	2	1						29	3
CHARIOT	11	8	5	2	2	1						29	3
OTIS	11	8	1	1	1		1					23	3
STEFFI	9	3	4	2		1	1					20	3
VOLGA	9	5	4	2	2		2	2	1			27	3
MAUD	7	8	1		2	1					1	20	3
BRENDA	15	6	3	5								29	4
EUNOVA	15	7	5	2								29	4
ATEM	14	5	3	3	2	2						29	4
DERKADO	13	4	7	2	2		1					29	4
MAGDA	13	5	8	1	2							29	4
PENELOPE	13	12	1	3								29	4
KRONA	12	6	5	2	1		1					27	4
PRISMA	15	4	6	2	1	1						29	5
VISKOSA	14	2	8	4	1							29	5
GOLF	13	9	4	2	1							29	5
ORTHEGA	13	4	5	5	1	1						29	5
BARONESSE	12	6	5	4	1	1						29	5
EXTRACT	12	2	6	5	4							29	5
MADONNA	12	6	5	5	1							29	5
MARESI	12	4	6	3	3	1						29	5
APEX	11	5	5	5	1		1		1			29	5
MELTAN	11	4	4	4	1	2				1		27	5
PRESTIGE	11	5	8	4	1							29	5
SALOON	11	5	7	5	1							29	5
ANNABELL	15	2	9	1	2							29	6
HANKA	13		11	2	3							29	6
ALEXIS	12	5	4	3	4	1						29	6
BARKE	12	2	12	1	1		1					29	6
THURINGIA	11	6	7	2	2		1					29	6
SCARLETT	13	5	6	2	3							29	7
Σ	542	214	201	113	57	16	12	3	2	1	2	1163	

coloration of the auricles, the other to be without. The country evaluating the presence of the anthocyanin coloration of the tips states the intensity to be very weak or absent (note 1). Concerning 'Maud' character 23: Grain: husk (presence or absence) has been described by 2 countries. One country stating presence the other absence.

Character 25 (Spiculation of inner lateral nerves of dorsal side of lemma) also shows a very high variation between 2 countries. one country stating absence (1) the other strong to very strong (8).

'Volga' shows a high variation between testing sites. The difference between two testing offices submitting descriptions on:

- Character 4 (Flag leaf: intensity of anthocyanin coloration) is 5 states of expression (4-9).
- Character 5 (Plants: frequency of plants with recurved flag leaves) is 5 states of expression (3-8) and
- Character 25 (Grain: spiculation of inner lateral nerves of dorsal side of lemma) is 6 states of expression (1-7)

In Table 5 it is not possible to evaluate which characteristics are described in a harmonized way between testing offices. In Table 6 the same counting as in Table 5 is done, but this time based on the characteristic. In Table 5 the characteristics are grouped as:

- Grouping and asterix characteristics
- Asterix characteristics
- Non asterix characteristics

Table 6: Summary of Annex 1. Average standard deviation of selected characteristics and varieties

			0	0.5	1	1.5	2	2.5	3	3.5	4	5	5.5	All	Har
2	*-g	Lowest leaves: hairiness of leaf sheaths	40	1										41	H
8	*-g	Awns: anthocyanin coloration of tips	41						1					42	H
13	*-g	Ear: number of rows	42											42	H
22	*-g	Grain: rachilla hair type	41	1										42	H
26	*-g	Grain: hairiness of ventral furrow	42											42	H
29	*-g	Seasonal type	42											42	H
		Σ	248	2					1						
1	*	Plant: growth habit	2	21	16	2	1							42	NH
3	*	Flag leaf: anthocyanin coloration of auricles	39		1		1						1	42	H
4	*	Flag leaf: intensity of anthocyanin coloration of auricles		13	16	10	1			1				41	NH
7	*	Time of ear emergence	11	18	8	3								40	AH
9	*	Awns: intensity of anthocyanin coloration of tips		3	11	17	10	1						42	NH
10	*	Ear: glaucosity	3	7	16	7	6	1	2					42	NH
12	*	Plant: length (stem, ear and awns)	5	9	15	7	3							39	NH
15	*	Ear: density	8	20	9	3								40	AH
17	*	Awn: length (compared to ear)	1	5	10	15	4	1	4					40	NH
20	*	Sterile spikelet: attitude	21	19										40	H
23	*	Grain: husk	38		1								1	40	H
		Σ	128	115	103	64	26	3	6	1			2		
5		Plant: frequency of plants with recurved flag leaves	4	8	8	6	5	6	3	2				42	NH
6		Flag leaf: glaucosity of sheath	7	18	13	3	1							42	AH
11		Ear: attitude		6	16	7	8	5						42	NH
14		Ear: shape	17	2	10	5	3		1					38	AH
16		Ear: length (excluding awns)	4	11	14	4	2							35	NH
18		Rachis: length of first segment	8	13	10	7								38	AH
19		Rachis: curvature of first segment	7	12	8	7	4							38	NH
21		Median spikelet: length of glume and its awn relative to grain	27	7		2	1							37	H
24		Grain: anthocyanin coloration of nerves of lemma	1	11	16	8	4	2						42	NH
25		Grain: spiculation of inner lateral nerves of dorsal side of lemma	24	4	3		3		1		2	1		38	AH
27		Grain: disposition of lodicules	34											34	H
28		Grain: color of aleurone layer	33	5										38	H
		Σ	166	97	98	49	31	13	5	2	2	1			
	*		542	214	201	113	57	16	12	3	2	1	2	1163	

Har: Level of harmonization

H-harmonized description 12 characteristics

AH-Acceptable harmonized description 6 characteristics

NH-Non harmonized description 11 characteristics

Within the grouping characteristics the observed variation has already been explained. All grouping characteristics are considered to be harmonized between testing offices, but some data need a careful evaluation to eliminate possible mistakes in the future. Character 8 should always be stated in connection with character 9 (Awns: Intensity of anthocyanin coloration of tips).

Both asterisk and non-asterisk characteristics show a variation in the state of expression between countries within the same variety.

The characteristics have been classified into 3 groups:

- Harmonized expression between testing offices. STD falls principally within 0 or .5 interval. The states of expression can be used between testing offices for pre-screening the collection of varieties to select the most similar varieties.
- Acceptable harmonized expression between testing offices. The STD shows that the variation within most varieties is between 2 and maximum 3 stages of expression. These characteristics can be used for pre-screening, but a careful approach must be used.
- Non-harmonized expression of the characteristic between testing offices. These characteristics are highly susceptible to environmental influence. In relation to pre-screening these characteristics are doubtful. Out of 29 characteristics 11 characteristics are considered as non-harmonized.

Using a more statistical approach to evaluate the variation in the received data set a general linear model is used to estimate the size of the main effects.

- Variations caused by difference among the varieties.
- Variation caused by a possible shift in the level of score from country to country.
- Variation caused by a possible trend over the years (from 1972 to 2001).

Table 7: Source of variation expressed as mean squares

			Varieties	Countries	Years
2	*-g	Lowest leaves: hairiness of leaf sheaths	0.01	0.01	0.00
8	*-g	Awns: anthocyanin coloration of tips	0.34	0.59	0.01
13	*-g	Ear: number of rows	0.00	0.00	0.00
22	*-g	Grain: rachilla hair type	0.31	0.02	0.00
26	*-g	Grain: hairiness of ventral furrow	0.00	0.00	0.00
29	*-g	Seasonal type	0.00	0.00	0.00
1	*	Plant: growth habit	1.74	3.75	0.00
3	*	Flag leaf: anthocyanin coloration of auricles	0.88	0.33	1.25
4	*	Flag leaf: intensity of anthocyanin coloration of auricles	5.21	11.12	0.85
7	*	Time of ear emergence	1.76	2.38	0.07
9	*	Awns: intensity of anthocyanin coloration of tips	7.03	24.51	1.34
10	*	Ear: glaucosity	5.55	12.22	1.70
12	*	Plant: length (stem, ear and awns)	1.73	9.92	1.57
15	*	Ear: density	2.83	1.58	1.44
17	*	Awn: length (compared to ear)	2.15	13.37	3.33
20	*	Sterile spikelet: attitude	0.92	0.88	0.28
23	*	Grain: husk	0.57	0.68	0.00
5		Plant: frequency of plants with recurved flag leaves	3.02	26.32	0.10
6		Flag leaf: glaucosity of sheath	1.17	1.99	0.08
11		Ear: attitude	2.86	23.93	1.05
14		Ear: shape	0.99	2.59	0.41
16		Ear: length (excluding awns)	1.59	3.36	3.19
18		Rachis: length of first segment	2.57	2.68	0.79
19		Rachis: curvature of first segment	3.70	2.49	0.39
21		Median spikelet: length of glume and its awn relative to grain	0.29	0.22	1.15
24		Grain: anthocyanin coloration of nerves of lemma	9.30	7.06	4.73
25		Grain: spiculation of inner lateral nerves of dorsal side of lemma	7.31	5.77	1.21
27		Grain: disposition of lodicules	0.09	0.00	0.00
28		Grain: color of aleurone layer	0.08	0.15	0.11

over the years (from 1972 to 2001).

- Variation caused by interaction between countries and varieties and variation caused by rounding off the scores to whole numbers.

In Table 7 the mean square for each source is presented.

A few characters do not show any variation, i.e. for characters No 2, 13, 26, 27, 28 and 29 the variation of all sources is zero or almost zero caused by the fact that practically just one of the possible expressions is used for these characters.

The most important source of variation seems to be country as 17 out of the remaining 23 characters have the largest mean square for this source. Characters 5, 9 and 11 have a very large mean square for country. For these characters the level of expression between the two most extreme countries differs by approximately 5, 4 and 4, respectively.

Characters 16, 17 and 18 show a relative high mean square for year. For those 3 characters the expression increased slightly with year (the increase was approximately 1 score unit per 16 years).

There is a good correlation between the classification of characteristics in Table 5 and Table 6. Only character 25 has been classified as acceptably harmonized whereas the characteristic in Table 6 shows a high mean square based on countries as mean effect.

Q5. Please fill in the results obtained from the DUS-testing carried out in the years 1996-2000.

AT	1996			1997			1998			1999			2000		
	min	max	avg	min	max	avg	min	max	avg	min	max	avg	min	max	avg
Time of ear emergence	6.18.	6.23.	6.20.	6.7.	6.12.	6.9.	6.3.	6.6.	6.4.	6.3.	6.8.	6.5.	5.28.	6.1.	5.29.
Plant height	65	80	72	50	68	62	52	70	63	80	101	92	51	70	62
CZ	1996			1997			1998			1999			2000		
	min	max	avg	min	max	avg	min	max	avg	min	max	avg	min	max	avg
Time of ear emergence	7.6.	21.6.	13.6.	5.6.	18.6.	13.6.	29.5.	8.6.	6.6.	30.5.	12.6.	6.6.	20.5.	6.6.	27.6.
Plant height	83	113	98,5	*	*	*	72	105	87,5	70	102	89,1	58	89	71,8
DK	1996			1997			1998			1999			2000		
	min	max	avg	min	max	avg	min	max	avg	min	max	avg	min	max	avg
Time of ear emergence	16.6.	3.7.	22.6.	12.6.	26.6.	17.6.	10.6.	26.6.	18.6.	6.6.	21.6.	13.6.	13.6.	27.6.	19.6.
Plant height	54	105	75	54	94	70	56	98	71	58	101	76	43	78	57
FR	In two test locations														
La Minière (78)	1996			1997			1998			1999			2000		
	min	max	avg	min	max	avg	min	max	avg	min	max	avg	min	max	avg
Time of ear emergence	5.6.	3.7.	21.6.	28.5.	9.6.	5.6.	31.5.	19.6.	12.6.	4.6.	21.6.	15.6.	27.5.	22.6.	12.6.
Plant height, cm	55	118	79	Not realised: Beating done			51	100	73	60	109	79	60	105	80
FR															
Le Magneraud (17)	1996			1997			1998			1999			2000		
	min	max	avg	min	max	avg	min	max	avg	min	max	avg	min	max	avg
Time of ear emergence	21.5.	12.6.	2.6.	19.5.	11.6.	25.5.	19.5.	8.6.	25.5.	24.5.	7.6.	1.6.	21.5.	11.6.	27.5.
Plant height, cm	Non available			Non available			N A	N A	65	N A	N A	86	N A	N A	90
NZ	1996			1997			1998			1999			2000		
	min	max	avg	min	max	avg	min	max	avg	min	max	avg	min	max	avg
Time of ear emergence	27.11.	30.11.	28.11.	28.11.	2.12.	1.12.	No	trial		No	trial		No	trial	
Plant height	740	850	810	625	845	760									
	Data of Egorjevsk plant variety testing station (Moscow area)														
RU	1996			1997			1998			1999			2000		
	min	max	avg	min	max	avg	min	max	avg	min	max	avg	min	max	avg
Time of ear emergence	16.6.	2.7.	23.6.	24.6.	2.7.	29.6.	7.7.	9.7.		14.6.	30.6.	23.6.	19.6.	7.7.	27.6.
Plant height	52	83	65	58	91	74	48	74	58	31	52	42	30	75	58
SL	1996			1997			1998			1999			2000		
	min	max	avg	min	max	avg	min	max	avg	min	max	avg	min	max	avg
Time of ear emergence	29.5.	20.6.		24.5.	13.6.		16.5.	5.6.		19.5.	7.6.		19.5.	9.6.	
Plant height	65	102	83,5	65	105	85	55	85	70	68	110	89	60	90	75
DE	1996			1997			1998			1999			2000		
	min	max	avg	min	max	avg	min	max	avg	min	max	avg	min	max	avg
Time of ear emergence	3	7	5,0	3	7	4,7	2	7	4,8	3	7	4,7	3	7	5,3
Plant height	2	7	4,5	3	7	4,4	1	7	4,5	3	8	5,3	2	7	4,9
EE	1996			1997			1998			1999			2000		
	min	max	avg	min	max	avg	min	max	avg	min	max	avg	min	max	avg
Time of ear emergence	1	7	4	1	7	4	1	7	4	3	5	4	3	7	5
Plant height	1	9	5	1	9	4	3	7	3	1	5	3	1	5	4
UK	1996			1997			1998			1999			2000		
	min	max	avg	min	max	avg	min	max	avg	min	max	avg	min	max	avg
Time of ear emergence															21/6.
Plant height															*

CZ * The field trials were flooded in the growing season 1997.

FR In La Minière (1996) all database are not available. We have given the 1995 data.

N A : Non available
UK *not yet completed

Please indicate the method of recording the following quantitative characteristics for barley:

- Time of ear emergence
- Plant length
- Ear and awn length

[X] Based on the example varieties a scale is produced. The varieties under test are scored according to this scale.

AT, CZ, DE, FR, NO, RU, UK, EE, SL

[] A fixed scale representing the states of expressions exists. The varieties under test are scored according to this fixed scale (Please give details about the scale used).

[X] The average of all varieties represents the score 5 (medium). An equidistant scale with the LSD value representing one state of expression is produced. The varieties under test are scored according to this scale.

DK, NZ

[] Others (please indicate)

DE	Time of ear emergence (1 value/variety) Plant length (1 value/variety) Ear and awn length (20 measurements/variety) The states are fixed considering the example varieties, the whole range of the collection and the applied minimum distance. The scale is equidistant where the size of one state is at least one time the minimum distance. The minimum distance is fixed according to experience. In case of single plant measurements the minimum distance is not lower than the calculated LSD.
FR	Time of ear emergence : Time when 50% of plant are at ear emergence state Plant length : 6 measurements / location Ear and awn length : Ear length : visually assessed on 150 harvested ears; Awn length : 6 measurements / location

Q6. Please indicate the example varieties grown in the DUS testing 2001 by placing an “x” in the appropriate box.

(The example varieties of TG/19/10 are listed with the characteristics in which they represent a specific state of expression.)

X Alexis	1, 2, 3, 5, 6, 7, 8, 9, 10, 15, 16, 19, 20, 21, 22, 23, 25, 26, 28, 29 AT, CZ, DE, DK, FR, UK, EE, SL	<input type="checkbox"/> Digger	1, 11	<input type="checkbox"/> Nomad	SL
X Aramir	13, 19 AT, DK, RU, SL	X Dobla	13 SL	X Omega	11, 14, 16, 17, 25, 27 12 FR, UK, SL
X Atem	4, 5, 9, 22 AT, DK, EE, SL	X Dobla	8 SL	<input type="checkbox"/> Perun	25
<input type="checkbox"/> Auto	4, 10	X Grit	1, 5, 10 CZ, UK, EE, SL	<input type="checkbox"/> Pompadour	6, 15
X Baronesse	20 AT, DE, DK, EE, SL	X Idare	5	X Prisma	4, 14, 19, 24, 27 CZ, DK, EE, SL
<input type="checkbox"/> Beate	9	X Ida	12 CZ, FR, UK	X Sewa	7 FR
X Berenice	9 RU, EE	X Klaxon	1 SL	X Sissi	11 DE, SL
<input type="checkbox"/> Bernice	19	<input type="checkbox"/> Lenka	24	X Steffi	21 AT, DE, DK, SL
X Cameo	19 SL	X Libelle	20 SL	X Taiga	23 AT, DE, SL
X Canut	7 FR, UK, SL	<input type="checkbox"/> Marielle	6	<input type="checkbox"/> Tea	15
X Ceres	2, 21 RU, EE	X Meltan	12 AT, CZ, DE, DK, FR, EE, SL	<input type="checkbox"/> Teo	24
X Cheri	26 AT, SL	X Menuet	17 SL	X Triumph	12, 18 AT, FR, UK, SL
X Comtesse	3 AT	X Mette	10, 11 EE, SL	X Troubadour	17, 14 SL
		X Michka	18 CZ, SL	X Volga	10, 18, 25 CZ, UK
		X Nancy	16		

x National reference varieties, please indicate (denomination and characteristic)
AT, CZ, DE

AR	No answer.
AT	National list of spring barley
CZ	AKCENT: 7(5), 9(3), 10(5), 14(5), 15(5), ATRIBUT: 25(3), FORUM: 4(9), 7(7), 10(7), 14(7), 15(7), 18(3), 19(1), GARANT: 11(3), HERAN: 6(9), 7(1), 9(5), 10(1), 12(1), 17(5), HERIS: 5(5), JUBILANT: 10(3), 20(2), KOMPAKT: 14(3), 16(3), LADIK: 1(3), 7(3), MADEIRA: 9(1), NORDUS: 4(3), NOVUM: 9(7), 12(5), 16(5), PRIMUS: 1(7), 5(7), 12(7), 17(7), 24(5), 25(1), 26(1), 27(2), PROFIT: 18(7), PROSA: 21(3), 26(9), RUBIN: 2(9), 4(5), 5(3). Remark: In parentheses, the relevant states of expression are indicated.
DE	KRONA: 1, 5, 8, 10, 12, 17, 22, 23, 24, 26, 28. SCARLETT: 1, 7, 11, 16, 24, 27. DERKADO: 6, 18. BRENDA: 9. THURINGIA: 15. CHARIOT: 16, 22, 25. APEX: 17. MADRAS: 26.
NO	Ven: 22. Fager: 6, 21. Olsok: 22.
NZ	No barley trial in this year. Fleet: 2. Optic: 18. Regatta: 1,9. Sherwood: 1. Valetta: 6,9.
SA	We only have the following barley varieties in South Africa: Cheetah; Clipper; Dayan; Diamant; Schooner; SSG 522; SSG 525; SSG 532; SVG 13; Stirling; Vloekskoot. All the varieties are planted with the candidate variety(ies); all varieties that differ significantly when compared visually, are eliminated from the evaluation, therefore only those varieties that are most similar to the candidate(s), will have a full morphological description for the season (growing cycle).
UK	Only UPOV example varieties are used to define character expression
EE	Anni: 1, 2, 3, 8, 9, 13, 15, 16, 16, 17. Midas: 1, 4. Arve: 3, 4, 8, 13, 18, 19, 21, 27. Tyra: 4, 3, 9, 24. Teele: 5, 7, 25, 27. Aura: 12. Maresi: 6, 24, 25. Mazurka: 1, 9, 10, 12, 22, 24. Henni: 6, 19. Mentor: 6, 12. Kinnan: 7. Apex: 7, 9. Elo: 9, 11, 15. Inari: 9, 16, 18. Marina: 10. Meltan: 12, 14, 20, 21, 22, 23, 26, 27, 28.

Table 8: Number of example varieties between countries

Country	Origin	No
-	UPOV	11
AT	UPOV	10
CZ	NAT	13
CZ	UPOV	7
DE	NAT	8
DE	UPOV	6
DK	UPOV	7
EE	NAT	16
EE	UPOV	9
FR	UPOV	7
NO	NAT	3
NZ	NAT	5
RU	UPOV	3
SL	UPOV	23
UK	UPOV	7
	UPOV	40

- Q7. Please indicate the method used to obtain and renew the seed stock of example varieties
- Request the breeder/maintainer to provide a sample
AR, AT, CZ, DE, DK, FR, NO, NZ, RU, UK, EE, SL
 - Maintenance of the example varieties by the national office
AT, UK, EE
 - New varieties are selected as example varieties, representing a specific state of expression.
NZ, EE
 - Others (please indicate)

DE	The identity of the sample provided by the breeder/maintainer is checked with an official identity sample.
SA	Applicants must supply seed for a 5 year period (500 g) with the application. The seed is kept by the national office in the reference collection. When seed is nearly finished or when germination is low, the applicant is requested to supply fresh seed.
UK	Example varieties may be maintained by the national office if they are no longer available from the breeder.

Conclusions:

All grouping characteristics are expressed at the same stage of expression between testing offices, but some data need a careful evaluation to eliminate possible mistakes in the future. Character 8 should always be stated in connection with character 9 (Awns: Intensity of anthocyanin coloration of tips).

Both asterix and non-asterix characteristics show a variation in the state of expression between countries within the same variety.

The characteristics have been classified into 3 groups

- Harmonized expression between testing offices. STD falls principally within 0 or .5 interval. The states of expression can be used between testing offices for pre-screening the collection of varieties to select the most similar varieties (12 characteristics).
- Acceptable harmonized expression between testing offices. The STD shows, that the variation within most varieties is between 2 and maximum 3 stages of expression. These characteristics can be used for pre-screening, but a careful approach must be used (6 characteristics).
- Non-harmonized expression of the characteristic between testing offices. These characteristics are highly susceptible to environmental influence. In relation to pre-screening these characteristics are doubtful. Out of 29 characteristics 11 characteristics are considered as non-harmonized.

