

**Technical Working Party on Testing Methods and Techniques**

Second Session

Virtual meeting, April 8 to 11, 2024

**TWP/8/3****Original:** English**Date:** March 20, 2024**Technical Working Party for Vegetables**

Fifty-Eighth Session

Virtual meeting, April 22 to 25, 2024

**Technical Working Party for Ornamental Plants and Forest Trees**

Fifty-Sixth Session

Virtual meeting, April 29 to May 2, 2024

**Technical Working Party for Agricultural Crops**

Fifty-Third Session

Virtual meeting, May 27 to 30, 2024

**Technical Working Party for Fruit Crops**

Fifty-Fifth Session

Virtual meeting, June 3 to 6, 2024

---

**IMPLEMENTATION OF PURDY'S NOTATION FOR PEDIGREES IN UPOV PRISMA***Document prepared by an expert from the International Seed Federation (ISF)**Disclaimer: this document does not represent UPOV policies or guidance*

The annex to this document contains a copy of a presentation "Implementation of Purdy's notation for pedigrees in UPOV PRISMA", to be made by an expert from the International Seed Federation (ISF), at the Technical Working Parties (TWPs) in 2024.

[Annex follows]

# Implementation of Purdy's notation for pedigrees in **UPOV PRISMA**

Emerson Limberger  
UPOV TWPs  
April and May, 2024

1

## **UPOV PRISMA: PEDIGREE & DATA**

Systematic and methodological application of the TQ Classification

- Data
  - Architecture
  - Storage
  - Integrity



2

## UPOV PRISMA: PEDIGREE & DATA

Systematic and methodological application of the TQ  
Classification

- Data
  - Architecture
  - Storage
  - Integrity



**Architecture**  
Purdy allows to implement the same data organization and structure for all crops. It is a powerful way to develop queries based on denomination, find related varieties, dissect relationship or hybrid components. It enables searching for Technical Exams (TE). Example: parental lines of a new tomato hybrid or the IV of a new apple mutation.

3

## UPOV PRISMA: PEDIGREE & DATA

Systematic and methodological application of the TQ  
Classification

- Data
  - Architecture
  - Storage
  - Integrity



**Storage**  
Today there are several independent fields for different parts of a variety formula. There are also exclusive fields for different types of materials. Purdy's implementation would allow the elimination of multiple attributes associated with varieties, thus reducing the data storage cost, which is paid by variety owners.

4

## UPOV PRISMA: PEDIGREE & DATA

Systematic and methodological application of the TQ  
Classification

- Data
  - Architecture
  - Storage
  - Integrity



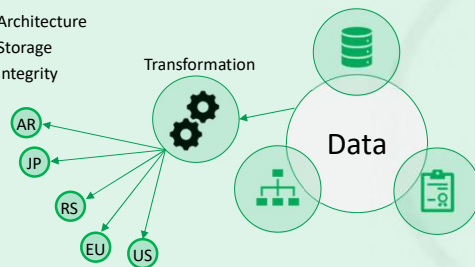
**Integrity**  
The multiple fields needed to inform variety attributes are not structured, which makes it hard to validate. It also challenging checking for consistency. Purdy would allow electronic applications to be validated on-the-fly before submission. For example, if the type of material doesn't match the information given in a formula, the user could be prompt to correct the information.

5

## UPOV PRISMA: PEDIGREE & DATA

Systematic and methodological application of the TQ  
Classification

- Data
  - Architecture
  - Storage
  - Integrity



**Member states | Information**  
The data informed through the Purdy system would simplify the input for users when applying in different authorities. At the same time the input data allow to be dissected and converted into the way that the member states expect.

6

## Purdy's notation system for genealogy

### HISTORY

Purdy's notation was proposed in 1968

Its intention was to simplify previous existing notations like Wiebe

Comprehensive system that is applicable to all crop species



## Purdy's notation system for genealogy

“PEDIGREES provide the **parentage of plant varieties** and are important sources of information to the plant breeder.”

“It is a **versatile method** of illustrating pedigrees.”

“It will be **easily understood** and **widely applicable**.”

“It can also be **used in automatic information**.”

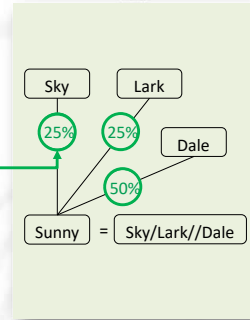


## Purdy's notation system for genealogy

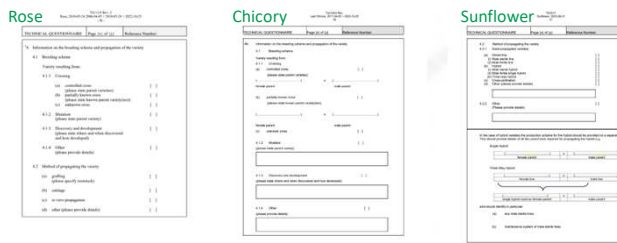
### ...used in automatic information

In **1968**, the original design was created to **calculate breeding values** by using the **pedigree notation** to **estimate** the **contribution** of each ancestor, which is used to weigh the phenotypes.

**Today**, this format allows to store in a single attribute many different questions that are asked in different fields in the TQ

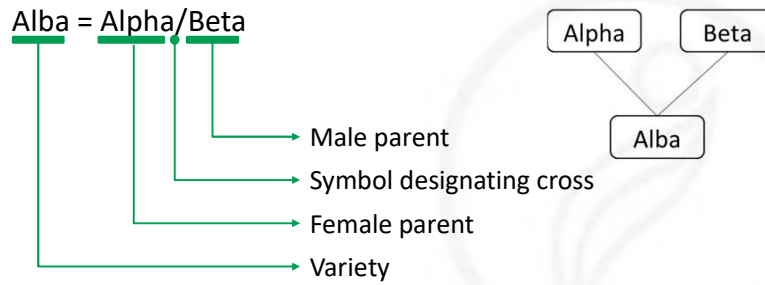


## TQ notation system for genealogy



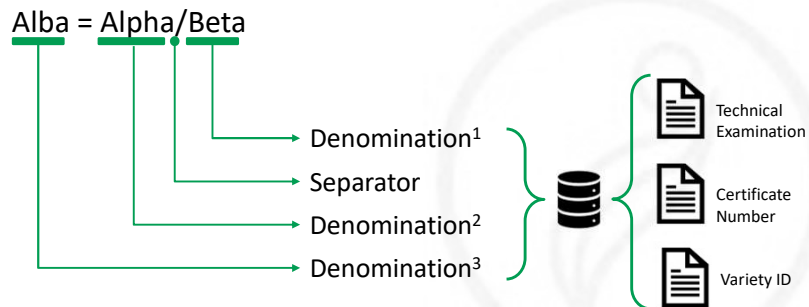
Alternative: Inform and store multiple fields in a single attribute

### Purdy's notation



11

### Purdy's notation for informatics



12

## Purdy's notation

The sign between parents is a slash ("/") instead of an ex ("x")

- Alpha x Beta → Alpha/Beta
- Felix x Xenia → Felix/Xenia

The number indicating successive crosses is placed within slashes

- Alpha x Beta 2x Gamma → Alpha/Beta/2/Gamma
- FEL 1X x 182YX 2x Power → FEL 1X/182YX/2/Power

The sign to indicate backcrosses is an asterisk ("\*") instead of an ex ("x")

- Alpha <sup>3</sup>x Beta → Alpha3\*Beta
- FEL 3X <sup>3</sup>x Power → FEL 3X3\*Power

13

## UPOV PRISMA: Purdy's application

**BREEDING SCHEME** Current

Method of propagation of the variety 4.2

Single hybrid 4.3

Three-way hybrid

female parent of single hybrid - A	Alpha
male parent of single hybrid- B	Beta
single hybrid used as parent- AB	Omega
male or female parent of three-way hybrid -C	Gamma
single hybrid used as female parent line	Omega
Three-way hybrid- (AB)C	(Alpha x Beta) x Gamma

Double Hybrid

The production scheme should identify in particular:

Open-pollinated variety

Other information on the method of propagating the variety 4.2

**BREEDING SCHEME** Proposal

Formula

14



## UPOV PRISMA: Purdy's application

**BREEDING SCHEME** Current

Method of propagation of the variety 4.2

Single hybrid 4.3

Three-way hybrid

female parent of single hybrid - A	1	Alpha
male parent of single hybrid- B	2	Beta
single hybrid used as parent-AB	3	Omega
male or female parent of three-way hybrid	4	Gamma
single hybrid used as female parent line	5	Omega
Three-way hybrid- (AB)C	6	(Alpha x Beta) x Gamma

6 fields and 6 attributes

Double Hybrid

The production scheme should identify in particular:

Open-pollinated variety

Other information on the method of propagating the variety 4.2

**BREEDING SCHEME** Proposal

Formula Alpha/Beta//Gamma

15

## UPOV PRISMA: Module

Question	Application 1	Application 2	Application 3	Application 4
Method of propagation of the variety	YES			
Inbred line	Confidential			
Inbred line: Please specify the genetic Origin				
Single hybrid				
Single hybrid: Denom or breeder's ref of female parental line of single hybrid			Alpha Gamma	
Single hybrid: Denom or breeder's ref of male parental line of single hybrid				
Should the question be treated as confidential?	YES		YES	
Three-way hybrid				
Three-way hybrid: female parent of single hybrid - A			Alpha	
Three-way hybrid: male parent of single hybrid- B			Beta	
Three-way hybrid: single hybrid used as parent- AB			Omega	
Three-way hybrid: male or female parent of three-way hybrid- C			Gamma	
Three-way hybrid: single hybrid used as female parent line			Omega	
Three-way hybrid: Three-way hybrid- (AB)C			(Alpha x Beta)Gamma	
Double Hybrid				
Double Hybrid: female parent of single hybrid - A			Alpha	
Double Hybrid: male parent of single hybrid- B			Beta	
Double Hybrid: female parent of single hybrid - C			Delta	
Double Hybrid: male parent of single hybrid- D			Gamma	
Double Hybrid: single hybrid A x B used as female parent			Omega	
Double Hybrid: single hybrid C x D used as female parent			Psi	
Double Hybrid: Double hybrid (AB)(CD)			(Alpha x Beta)(Delta x Gamma)	

From 22 rows to 1 row

Question	Application 1	Application 2	Application 3	Application 4
Formula	CONFIDENTIAL	Alpha/Gamma	Alpha/Beta//Gamma	Alpha/Beta//Delta/Gamma

Proposal

Data

16

**ISF International Seed Federation**  
Seed is Life

## UPOV PRISMA: Module

Question	Application 1	Application 2	Application 3	Application 4	
Method of propagation of the variety					
Inbred line	YES				
Inbred line: Please specify the genetic Origin	Confidential				
Single hybrid					
Single hybrid: Denom or breeder's ref of female parental line of single hybrid		Alpha			
Single hybrid: Denom or breeder's ref of male parental line of single hybrid		Gamma			
Should the question be treated as confidential?		YES			
Three-way hybrid					
Three-way hybrid: female parent of single hybrid - A			Alpha		
Three-way hybrid: male parent of single hybrid - B			Beta		
Three-way hybrid: single hybrid used as parent - AB			Omega		
Three-way hybrid: male or female parent of three-way hybrid - C			Gamma		
Three-way hybrid: single hybrid used as female parent line			Omega		
Three-way hybrid: Three-way hybrid - (A)B(C)			(Alpha x Beta)Gamma		
Double Hybrid					
Double Hybrid: female parent of single hybrid - A			Alpha		
Double Hybrid: male parent of single hybrid - B			Beta		
Double Hybrid: female parent of single hybrid - C			Delta		
Double Hybrid: male parent of single hybrid - D			Gamma		
Double Hybrid: single hybrid A x B used as female parent			Omega		
Double Hybrid: single hybrid C x D used as female parent			Psi		
Double Hybrid: Double hybrid (A)B(CD)			(Alpha x Beta)(Delta x Gamma)		
From 22 rows to 1 row					15/72
Question	Application 1	Application 2	Application 3	Application 4	
Formula	CONFIDENTIAL	Alpha/Gamma	Alpha/Beta//Gamma	Alpha/Beta//Delta/Gamma	4/4
	1/1	1/1	1/1	1/1	

**Data**  
Attributes and data points

17

**ISF International Seed Federation**  
Seed is Life

## UPOV PRISMA: eForm

**Proposal**

Method of propagation of the variety 4.2

Single hybrid 4.3

Three-way hybrid

female parent of single hybrid - A

male parent of single hybrid- B

single hybrid used as parent- AB

male or female parent of three-way hybrid -C

single hybrid used as female parent line

Three-way hybrids- (A)B(C)

Double hybrid

The production scheme should identify in particular:

Open-pollinated variety

Other information on the method of propagating the variety 4.2

➔

**BREEDING SCHEME**

Type of material 4.1 \*

Breeding scheme 4.1 \*

Material type

Formula

18

**ISF** International Seed Federation  
Seed is Life

### UPOV PRISMA: eForm

**Proposal**

Method of propagation of the variety 4.2

- Single hybrid 4.3
- Three-way hybrid

female parent of single hybrid -A: Alpha  
male parent of single hybrid-B: Beta  
single hybrid used as parent-AB: Omega  
male or female parent of three-way hybrid -C: Theta  
single hybrid used as female parent line:   
Three-way hybrid-(A)B(C):

Double Hybrid  
 The production scheme should identify in particular:  
 Open-pollinated variety  
 Other information on the method

**Isn't that the denomination?**

**Isn't that the same as AB?**

**BREEDING SCHEME**

Type of material 4.1 \*

Breeding scheme 4.1 \*

Material type: Three-way hybrid

Formula: Alpha/Beta(Omega)//Gamma

19

**ISF** International Seed Federation  
Seed is Life

### Transition

**Paper system**

Unstructured information

Input

Output


**Electronic system**

(Un)structured information

Input


Output

20

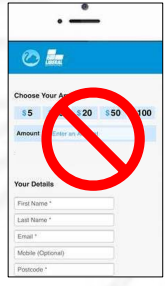



### Transition


**Paper system**



**Electronic system**



21



### UPOV PRISMA: eForm

**BREEDING SCHEME**

04 - 02 - Method of propagation of the variety \*

04 - 02.01 - In the case of hybrid varieties the production scheme should be provided. This should provide details of all the parent lines required for propagating the hybrid e.g.

04 - 02.01.01 - Single hybrid  
(this question could be confidential)

Denomination or breeder's reference of female parental line of single hybrid: [ ]

Denomination or breeder's reference of male parental line of single hybrid: [ ]

04 - 02.01.02 - Three-Way hybrid  
(this question could be confidential)

single hybrid (below) used as female parent: [ **Beta** ]

male parent line: [ **Alpha** ]

single hybrid (below) used as female parent: [ **Gamma** ]

male parent line: [ **Omega** ]

04 - 02.01.03 - Double Hybrid  
(this question could be confidential)

Denomination or breeder's reference of female parental line of the single hybrid used as female parent: [ ]

Denomination or breeder's reference of male parental line of the single hybrid used as female parent: [ ]

Denomination or breeder's reference of female parental line of the single hybrid used as male parent: [ ]

Denomination or breeder's reference of male parental line of the single hybrid used as male parent: [ ]

04 - 02.01.04 - The seed-offspring criteria should identify the material type

**BREEDING SCHEME**

Type of material: 1 \*

Breeding scheme: 1 \*

Material type: (Three-way hybrid)

Formula: Alpha/Beta/Omega/Gamma

Method of propagation of the variety: 1 \*

Single parent: 1 \*

Two parents of single parent: 0

Three parents of single parent: 0

Four parents of single parent: 0

Five parents of single parent: 0

Single parent used as female parent: 0

Single parent used as male parent: 0

Female parent: 0

Male parent: 0

Female parent used as female parent: 0

Female parent used as male parent: 0

Male parent used as female parent: 0

Male parent used as male parent: 0

Other materials in the method of propagating the variety: 1 \*

22

## Purdy's implementation

### Variation

Alpha/Beta/2/Gamma → (Alpha/Beta)/Gamma

Alpha/Beta/2/Gamma/Theta → (Alpha/Beta)/(Gamma/Theta)

### Wizard

User guided steps within PRISMA

Indication after the selection of type of material

23

## Purdy's notation system for genealogy formula in

### UPOV PRISMA

Purdy's notation allows to:

Simplify the technical questionnaire

- Common components for the TQ for all **authorities** and all **crops**

Harmonize the technical questionnaire across all species while the information required by different member states are fulfilled

Enable validation

Decrease errors

Design optimal data storage

24

