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SHORT COMMUNICATION

Selection of duplicates of flax accessions – an important task in the management of collection of genetic resources of *Linum usitatissimum* L.

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Summary

Introduction: The Institute of Natural Fibres and Medicinal Plants National Research Institute (IWNiRZ) – formerly Institute of Natural Fibres, together with Plant Breeding and Acclimatization Institute (IHAR) in Radzików carry out tasks related to the protection of genetic resources of flax (*Linum usitatissimum* L.). Genetic resources of flax are stored as seeds in IHAR refrigeration chambers. The research material consisted of passport data of genetic resources of flax.

Objective: The aim of the presenting the identification of duplicates of accessions of flax in documentation of the National Center of Plant Genetic Resources (IHAR). This will facilitate the management of the collection of flax genetic resources. Removal of duplicate accessions from the collection of flax genetic resources will save storage space in long-term chambers, savings in storage costs, savings in working hours.

Methods: The working methods were studying the passport database and the institute's gene bank documentation.

Results: In the cooling chambers of the seed bank at KCRZG at IHAR, unintentional duplicates are stored: 29 flax accessions with the same accessions number and 19 flax accessions with two different accession numbers.

Conclusions: The presentation in the article of two types of duplicates of flax accessions is very helpful in managing the collection of genetic resources of flax. Reducing the number of genotypes in the flax collection will facilitate the faster collection of all valorization data, which will be very helpful for users of the collection of genetic resources of flax.

Key words: *genetic resources, flax, Linum usitatissimum L., duplicates of accessions, collection management*

Słowa kluczowe: *zasoby genetyczne, len, Linum usitatissimum L., duplikaty obiektów, zarządzanie kolekcją*

INTRODUCTION

Plant germplasm conservation is one of principal items of the Biodiversity Convention [1-3].

Due to geographic-natural and socio-economic conditions, Poland has a large variety of genetic resources, wild species and species, varieties and breeds, occurring both in the wild (*in situ*) and in *ex situ* collections [4].

The collection of genetic resources of flax began in the 1920s before the establishment of the Linen-Central Experimental Station in Vilnius in 1930 – the precursor of present Institute of Natural Fibres and Medicinal Plants (IWNiRZ). Gathering the best plants initially and then various European varieties was associated with start of flax cultivation, initially by mass selection and later by cross-breeding method. Initially, all information on the collected flax accessions in the *Linum usitatissimum* L. genetic resource collection was recorded in paper documentation.

Systematic collection of national genetic resources has been carried out since 1971 [5].

The National Centre for Plant Genetic Resources (KCRZG) of utility plants at Plant Breeding and Acclimatization Institute (IHAR) in Radzików has been working on a documentation system for the needs of users of collected seeds (scientists, growers, business owners, hobbyists and others). Currently, there is a lot of interest concerning stored accessions to obtain information on their biological, agricultural, morphological and technological features [6-10]. Electronic documentation of valorised features of genetic resources of utility plants is one of the most important tools supporting rational management of collected accessions and their use [6].

The Institute of Natural Fibres (now IWNiRZ) in Poznań has been carrying out tasks related to the protection of genetic resources of flax since 1982 and since 2009 IWNiRZ [11-14]. In 2015–2020, IWNiRZ provided a research service for IHAR entitled “Collection and preservation in field collections, *in vitro* and cryopreservation, characteristics, evaluation, documentation and sharing of genetic resources and information in the field of agricultural plants and other useful plants, related wild species and varieties”. An important task is to select potential duplicates for verification in terms

of their removal from the collection of *L. usitatissimum*. The removal of unintended duplicates will contribute to a better management of the flax genetic resources collection, which is highly important in public health [15-23].

MATERIAL AND METHODS

The subject of the work was the passport database sent by Martin Pavelek as part of the international (ECP/GR) cooperation. The structure of the International Flax Database Structure, passport part, was obtained after the first meeting of the newly established flax and hemp working group: ECPGR (European Cooperative Programme for Plant Genetic Resources) Working Group on Fibre Crops (Flax and Hemp), in the framework of Sugar, Starch and Fibre Crops Network.

The database of passport collection of flax genetic resources prepared at the IWN was assessed in terms of removing unintended duplicates in the database. Work also consisted of studying the documentation of advanced fibre flax lines grown in the Institute of National Remembrance, submitted for registration research at COBORU. For example, it was noticed that the Polish Gene Bank in Radzików stores the same genotype: No. 165727 – Bryta fiber flax variety (IWN00215) and No. 165504 an advanced breeding line before registration in COBORU, as Bryta, i.e. PET 79. These are duplicates [24]. We strive to reduce the costs of storage in the refrigeration chambers of the collection of crops, therefore, information on duplicates was provided to KCRZG in Radzików.

Tables 1 and 2 provide a list of duplicates stored in the IHAR seed bank of flax accessions with the same accession number (tab. 1) and with different accession numbers (tab. 2). Collecting number is the number of flax samples in long-term storage (KCRZG IHAR).

The survey containing crop-specific genebank standards for orthodox seeds – flax, agreed by the Fibre Crops (Flax and Hemp) Working Group, is available in the website of the National Centre for Plant Genetic Resources, Plant Breeding and Acclimatization Institute.

Table 1.

List of selected duplicates stored in the IHAR seed bank of flax accessions (*Linum usitatissimum* L.) with the same accession number (collecting number duplicates)

No	The first seed sample stored flax accessions		Duplicate seed sample stored flax accessions		Accession number	Duplicates of flax accessions (<i>Linum usitatissimum</i> L.)
	Accession name	Collecting number	Accession name	Collecting number		
1	Izolda	165501	Izolda	165575	IWN00052	165501=165575
2	Pet 23	165503	Pet 23	165911	IWN00396	165503=165911
3	PET 79 (Bryta)	165504	Bryta (PET 79)	165727	IWN00215	165504=165727
4	Svapo	165505	Svapo	165895	IWN00382	165505=165895
5	LCSD 200	165506	LCSD 200	165578		165506=165578
6	Fortuna	165508	Fortuna	165609	IWN00037	165508=165609
7	Minerwa	165510	Minerwa	166058		165510=166058
8	Milenium	165511	Milenium	165910 166056	IWN00394	165511=165910=166056
9	Istru	165513	Istru	165755	IWN00050	165513=165755
10	I-7	165540	I-7	165660	IWN00044	165540=165660
11	Pacyfic	165549	Pacyfic	166181	IWN00088	165549=166181
12	Olena Trifolium	165550	Olena Trifolium	165675	IWN00087	165550=165675
13	Iduna	165568	Iduna	165754	IWN00047	165568=165754
14	Ł-1120	165581	Ł-1120	165668	IWN00069	165581=165668
15	Marokański	165586	Marokański	165670	IWN00075	165586=165670
16	Natasja	165590	Natasja	165793	IWN00079	165590=165793
17	Istru	165613	Istru	165755	IWN00050	165613=165755
18	Alba	165708	Alba	166205	IWN00196	165708=166205
19	Antares	165712	Antares	166090 166104	IWN00200	165712=166090=166104
20	ICA 44	165753	ICA 44	166117	IWN00240	165753=166117
21	Pet 179	165800	Pet 179	165502	IWN00196	165800=165502
22	Waza	165845	Waza	166052	IWN00328	165845=166052
23	Wiko	166053	Wiko	166092	IWN00605	166053=166092
24	Szafir	166054	Szafir	166126	IWN00636	166054=166126
25	Opal	166055	Opal	166125	IWN00635	166055=166125
26	Jitka	166064	Jitka	166147	IWN00653	166064=166147
27	Artemida(SIK 494)	166066	Artemida(SIK 494)	166242	IWN00778	166066=166242
28	Dufferin	166070	Dufferin	166113	IWN00540	166070=166113
29	Laura	166071	Laura	166096	IWN00536	166071=166096
30	CVT-LC-36	166209	CVT-LC-36	166278	----	166209=166278

Table 2.

List of selected duplicates stored in the IHAR seed bank of flax accessions (*Linum usitatissimum* L.) with different accession number (duplicates collecting number result from duplicates of collection numbers)

No.	The first seed sample stored flax accessions		Duplicate seed sample stored flax accessions		Introduction number	Duplicates of flax accessions (<i>Linum usitatissimum</i> L.)	
	Accession name	Accession number	Accession name	Accession number			
1	IWN00010	Belinka	165523	IWN00212	Belinka	165723	IWN00010= IWN00212 165523=165723
2	IWN00057	Kenya	165571	IWN00624	Kenya	166213	IWN00057= IWN00624 165571=166213

Table 2. (continued)

No.	The first seed sample stored flax accessions		Duplicate seed sample stored flax accessions		Introduction number	Duplicates of flax accessions (<i>Linum usitatissimum</i> L.)	
	Accession name	Accession number	Accession name	Accession number			
3	IWN00068	Linott	165580	IWN00615	Linott	166109	IWN00068= IWN00615 165580=166109
4	IWN00080	Noralta	165591	IWN00617	Noralta	166111	IWN00080=IWN00617 165591=166111
5	IWN00085	Ottawa 770B	165595	IWN00660	Ottawa 770B	166157	IWN00085=IWN00660 165595=166157
6	IWN00088	Pacyfic	165549	IWN00688	Pacyfic	166181	IWN00088=IWN00688 165549=166181
7	IWN00172	Raja	165684	IWN00749	Raja	166230	IWN00172= IWN00749 165684=166230
8	IWN00250	Kijewskij	165764	IWN00705	Kijewskij	166197	IWN00250= IWN00705 165764=166197
9	IWN00286	PEK 382 (Nike)	165803	IWN00337	Nike (PEK 382)	166051	I17441= (PEK 382; I17689=Nike IWN00286= IWN00337 165803=166051= = I17441= I17689
10	IWN00335	Żółtonasienny	165852	IWN00336	Żelto-siemiannyj	165853	IWN00335=IWN00336 165852=165853
11	IWN00340	Mrija	165792	IWN00799	Mrija	166252	IWN00340=IWN00799 165792=166252
12	IWN00380	Swietocz	165893	IWN00525; IWN00609	Swietocz	166039; 166097	IWN00380= IW00525= IWN00609 165893=166039=166097
13	IWN00612	Evelin FRA		IWN00652	Evelin NLD		IWN00612= IWN00652
14	IWN00616	Hermes	166110	IWN00650	Hermes	166146	166110=166146
15	IWN00780	Selena (SIK 599)	166201			I17839	166201=I17839
16	IWN00831	Agatha (NLD)	166260	IWN00836	Agatha (FRA)	166265	IWN00831=IWN00836 166260=166265
17		Jantarol	502905			12 I01004	502905=12 I01004
18		Jan	505178			17 I00267	505178=17I00267
19	IWN00779	Modran	166203			I17841	166203= I17841

Ethical approval: The conducted research is not related to either human or animal use.

RESULTS

In the cooling chambers of the seed bank at KCRZG at IHAR, unintentional duplicates are stored: 29 flax accessions with the same accessions number (tab. 1) and 19 flax accessions with two different accession numbers (tab. 2). For the following flax accessions, three seed samples are stored: Millenium (tab. 1), Antares (tab. 2) and four PEK 382=NIKE (tab. 2).

1. Identification of duplicates in the collection of flax genetic resources will enable the selection of

accessions for laboratory and genetic analyses, on the basis of which it will be possible to reduce the number of stored flax accessions by the National Centre for Plant Genetic Resources at IHAR.

2. The selection of duplicates from the collection of flax collected in Poland will contribute to cost savings, space in the storage room and working time of the employees of the long-term storage facility.

DISCUSSION

The gene bank protects breeding material and many years of achievements of Polish breeders and geneticists [1]. They are a part of the national property [1].

By the end of 2020, 829 accessions of flax had been deposited at the KCRZG Gene Bank. These are wild form, landraces, primitive cultivars, breeding lines, varieties of linseed, fibre flax and mixed types of use.

Passport data of the gathered flax accessions were stored in the paper documentation drawn up in accordance with the guidelines of the National Coordinator for Plant Genetic Resources Conservation (IHAR), based on information provided by the letter of October 5, 1987. IHAR recommended the following passport data: 1. accession number, 2. catalog number (according to the allocation of numbers developed in Radzików), 3. accession name and synonym/variety, former number of breeding line, 4. genus, 5. species, 6. subspecies, 7. type of accessions (wild – 1, landrace – 2, varieties – 3, breeding lines – 4, mutants – 5), 8. country of origin, 9. country of donors, 10. year the accession was included in the collection, 11. donor catalogue number.

In 2007, the curator of the *Linum* collection (Grażyna Silska) made a database of passport data collections of flax genetic resources based on the descriptors adopted by the European Cooperative Programme for Crop Genetic Resources Networks – ECP/GR for Plant Genetic Resources for Textile Crops Working Group [25, 26]. Passport data of the collection of flax accessions was sent to IHAR (Marcin Zaczynski) in 2007.

In general, plant germplasm as well as flax germplasm has only a small practical value, if available genetic resources are not evaluated and characterized according to an acknowledged evaluation system [27]. The identification of unintended duplicates reduces the number of accessions and this enables faster evaluation of the collection of genetic resources. It is a very important task in the management of flax collections of *Linum usitatissimum* L.

Important information for people managing the collection of flax resources are the names of advanced breeding lines, as this will avoid unnecessary duplicates of stored accessions [28].

The reason for assigning an additional number – accession number – to flax accessions was the lack of computer databases (tab. 1), a mistake in the name – Ewelina, Evelin (tab. 2), two different countries of the donor of the genotype – Agatha from the Netherlands and Agatha from France (tab. 2) or introduction of introduction numbers in place of collecting number in the IHAR seed bank (tab. 2).

CONCLUSIONS

1. Selecting of duplicates in the collection of genetic resources of flax is a very important task of the protection of genetic resources of cultivated plants.
2. During the preparation of the database of passport accession, collection curators assign a specific accession number to each newly gathered genotype – accession number.
3. The assigned accession numbers of the facilities collected, protected and stored in cold chambers, may not be changed and may not be removed from the already existing passport databases. Genetic resources are not allowed to change an existing accession number.
4. However, knowledge on duplicates in flax collection will allow better management of *L. usitatissimum* accessions by future curator of the collection and by employees of the National Center for Plant Genetic Resources, both for scrutinizing the storage and supervising the information collected in the Egiset database, which includes passport and valorisation data on plant genetic resources of flax stored at IHAR in Radzików.
5. Two types of duplicate flax accessions are stored in the refrigerated chambers: accessions with the same name under different IHAR numbers or accessions with different names: one sample – advanced breeding lines, the other – registered variety.
6. Selected duplicates should be genetically identified for removal from IHAR's long-term storage.
7. Some accessions need to be given the accession number.

Conflict of interest: Authors declare no conflict of interest.

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