Wheat landraces from Oman: A botanical analysis

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Abstract

The wheat landraces of Oman are characterized. Their main constituents are Triticum aestivum L. ssp. aestivum, T. aestivum ssp. hadropyrum (Flaksb.) Tzvel., T. compactum Host, T. aethiopicum Jakubz.ssp. aethiopicum, T. aethiopicum ssp. vavilovianum Jakubz. et A. Filat. and T. dicoccon Schrank. The classification of the landraces was performed using the morphological method developed by Dorofeev, Filatenko et al. (1979), considering species, subspecies, convarieties and a great number of botanical varieties. Single landraces contained up to three different species (“Sareeaa”) and up to 17 different botanical varieties (“Missani”). T. aethiopicum var. hajirense A. Filat. et K. Hammer is newly described. Keys for the determination of important Omani wheat races are proposed. 15 wheat landraces of Oman are characterized morphologically. A detailed list describing origin, local names, and infraspecific taxa of the material is provided. Transformation processes of the oasis settlements lead to a replacement of the traditional agricultural systems and the landraces are threatened by genetic erosion. Additional measures are necessary to increase the possibilities for on-farm conservation of the valuable material of landraces.

Key words: Wheat, Landraces, Triticum sp., Oman, Morphological characterization, Botanical classification

Introduction

Oman on the Arabian Peninsula at the crossroads of inter-regional exchange including also cultivated plants (Gebauer et al., 2007; Hammer et al., 2007) is still rich in landraces of various crops. For a long time Oman was a closed country with first possibilities for botanical exploration, especially in the last century. Older reports about wheats are very limited (Schwarz, 1939; Mandeville, 1977). The presence of different wheat species was not clear. Only some reports from neighbouring Yemen (Flaksberger, 1935; Vavilov, 1931, 1964) allowed some conclusions. A note about wheat in Oman opened the way for new activities (Schwarz, 1939; Mandeville, 1977). The presence of different wheat species was not clear. Only some reports from

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landraces. He also questioned the on-farm activities, as they have been done formerly, for the maintaining of landraces (Zeven, 1996). Landraces are commonly genetically heterogeneous, developed through traditional agriculture over thousands of years by local farmers (Brush, 1999; Hammer and Diederichsen, 2009). Landraces have remained variable over long times, because eco-geographical structures are largely adaptive. Wheat farming in Oman is dependent on irrigation except for a small area in northern Oman which depends on rainfall.

Material and Methods

Exploration and collecting missions have been organized in Oman (Al Maskri et al., 2003; Al Khanjari et al., 2005). Samples have been transferred to the experimental fields of the University of Kassel in Witzenhausen where the characterization and evaluation of the material took place.

The description of agronomically important and useful characteristics is an important prerequisite for effective and efficient use of germplasm collections in future breeding programs. The checklist-method has been used for a species survey (Hammer et al., 2004b, 2009).

For the characterization of the material, diversity studies have been carried out. Following the modern approach, a molecular evaluation was performed using microsatellites (Al Khanjari et al., 2005, 2007 a and b).

After a preliminary morphological characterization in 2002/2003 (Al Maskri et al., 2003; Hammer et al., 2004a), the classification and identification of the germplasm material was determined in 2010 (A. Filatenko). The basis for this work was the classical approach of Dorofeev, Filatenko et al. (1979) which allowed not only the determination of the species (for species designation we followed Hammer et al. (2011)), but also the infraspecific categories (a translation of the monograph is in preparation – Knüpffer et al., 2004). The methodology was developed in the Vavilov Institute, St. Petersburg and proved to be useful for an exact classification of the material, for getting information towards its diversity and for following the process of genetic erosion (Bürkert et al., 2006), particularly in cases of monitoring landraces in certain areas (Hammer et al., 1996).

A map of Oman is presented in Figure 1, a photo of variable landrace is shown in Figure 2, and the main collecting areas are presented in Table 1.

Figure 1. Map of Oman showing the Hajar Mountains where most of the newly discovered botanical wheat varieties were found (above) and the country’s different districts where the wheat germplasm survey was conducted (below)
Figure 2. Typical spikes of the landrace „Walidi” from Baladseet (Biladsayt) (left), 
*T. compactum* var. *maqtaense* (A. Filat. et K. Hammer) A. Filat. (Walidi) (right).

Table 1. Summary of the collection areas (point range).

| District | Altitude | Latitude | Longitude |
|---------|----------|----------|-----------|
| Dhahira | 300m - 700m | 56°30 - 56°37 | 23°41 - 23°18 |
| Batinah | 400m - 800m | 56°29 - 57°37 | 23°59 - 23°11 |
| Dakhilia | 300m - 900m | 57°04 - 57°12 | 22°48 - 23°06 |
| Sharquia | 300m - 1500m | 59°09 - 58°45 | 22°59 - 23°47 |
| Musandam | 50m - 400m | 55°57 - 56°18 | 26°04 - 24°24 |

**Results and Discussion**

Many botanical varieties of cultivated wheat have been observed and collected in Oman. The results of the classification are shown in Appendix 1. A short discussion arranged by species is provided in the following. Wild-growing species of wheat and *T. monococcum* L. have not been found in Oman.

**Hexaploid wheats**

*Triticum compactum* Host

The finding of a wide distribution of *T. compactum* in Oman is especially interesting. In the neighbouring countries this species is very rare (Iran), or not found at all (Ethiopia).

It is ecologically a typical mountain wheat, which includes, according to Vavilov (1935), moisture-loving forms with a low temperature requirement in the period of ripening and tolerance against decreasing temperature in spring, which are not demanding with respect to soil and cultivation conditions.

Three groups of varieties are distinguished within *T. compactum*. These were: convar. *compactum*, convar. *rigidicompactum* (Kudr.) A. Filat. and convar. *inflatum* (Vav. et Kob.) A. Filat. The latter one was not found in Oman (see Al Khanjari, 2005, 2007b, 2008).

Plants and spikes of *T. compactum* are of delicate structure, glumes usually thinly coriaceous, with a transverse depression at the base. Caryopses loosely enclosed by lemma and palea and easy to thresh. Convar. *compactum* is distributed throughout the whole Old World. In the 20th century it was particularly cultivated in Siberia, Russian Far East, Yakutia, Mongolia and China but never common.

*T. compactum* is not associated with any particular distribution area, but, according to Vavilov (1964), it represents relicts to a considerable degree. Two botanical varieties belong to convar. *compactum*, namely, var. *balatseetense* (K. Hammer et A. Filat.) A. Filat., var. *maqtaense* (A. Filat. et K. Hammer) A. Filat.

Spikes of this group are awned, half-awned; less often awnless, glumes rigid, more often half-rigid; caryopses closely enclosed in lemma and
palea, but are usually easy-to-thresh, less often threshing is difficult.

**Geographical distribution**

Mountain and foothill zones of Middle and South-West Asia, Transcaucasia, Mongolia, Oman.

Four botanical varieties belong to convar. rigidicompactum: var. mullicianana Kudr., var. linaza Koern., var. sedabense A. Filat. et K. Hammer, var. omanense A. Filat et K. Hammer.

Spikes of this group are awned, semi-awned or sometimes awnless, glumes rigid or usually semi-rigid; caryopses closely enclosed by lemma and palea, usually easy or sometimes difficult to thresh.

Generally, convar. rigidicompactum is characterised by a distinct polymorphism and represented by a considerable number of varieties.

**Triticum aestivum L.**

From the typical common wheat in Oman T. aestivum subsp. aestivum (European wheat) and T. aestivum subsp. hadropyrum (Asiatic wheat) convar. semirigidum A. Filat. et Dorof. are present.

Spikes of convar. semirigidum awned or awnless, semi-robust; glumes less coarse than those of convar. rigidum, with less distinct venation, caryopses not so firmly enclosed by palea and lemma, not falling, but easy to thresh.

Geographical distribution. T. aestivum convar. semirigidum has a very wide geographical distribution: West Asia, India, China, Mediterranean, Lower Volga, Transcaucasia and Arabian Peninsula (Oman).

Out of the 59 described varieties (Dorofeev, Filatenko et al., 1979) of convar. semirigidum, 12 were collected in Oman (only subconvar. semirigidum), one of them is a new variety (bold face): var. barbarossa (Alef.) Mansf., var. graecum (Koern.) Mansf., var. hostianum (Clem.) Mansf., var. ibraense K. Hammer et A. Filat., var. insignis (Kudr.) A. Filat., var. leucospermum (Koern.) Mansf., var. meridionale (Koern.) Mansf., var. pseudoerythrospermum (Kudr.) A. Filat., var. pseudohostianum (Flaksb.) Mansf., var. pseudoleucospermum (Kob.) Mansf., var. pseudopyrothrix (Kob.) Mansf., var. pulchrum (Kudr.) A. Filat.

Subsp. aestivum – European subspecies is present with 7 varieties in Oman; the altitudinal distribution ranged **between** 50 - 1500 m above sea level.

Plants and spikes of this group are of delicate structure, glumes usually thinly coriaceous, very various in shape, with a transverse depression at the base. Caryopses loosely enclosed by lemma and palea, easy to thresh, many forms with easily shedding grains exist, the degree of enclosure of the caryopsis by the lemma and palea is determined by the amount of convexity of the lower half of the glume and not by the coarse texture of the glume as in subsp. hadropyrum.

Geographical distribution. Throughout the range of T. aestivum.

Out of the 38 listed varieties of subsp. aestivum (Dorofeev, Filatenko et al., 1979), 3 were found in Oman: var. aestivum, var. anglicum (Aschers. et Graebn.) A. Filat., var. lutescens (Alef.) Mansf. and 3 have been newly discovered by us: var. arabicum K. Hammer et A. Filat., var. pseudosoharicum K. Hammer et A. Filat., var. soharicum K. Hammer et A. Filat.

The botanical diversity of hexaploid wheat species is poorer than in the main center of their origin –Southwest Asia (Turkestan, Afghanistan, East Iran, Northwest India). But, the botanical composition of the hexaploid wheats and the newly found varieties are good indications of the long-time evolution in the territories of Oman.

**Tetraploid wheats**

*Triticum dicoccon* Schrank

Full description about the hulled tetraploid *T. dicoccon* is available in Hammer et al. (2004a). *T. dicoccon* from Oman is intermediate between Asiatic (ssp. asiaticum Vav.) and Ethiopian (ssp. abyssinicum Vav.) races. It has not yet been included in molecular studies (Zhang et al., 2006; Teklu et al., 2007). In recent years it has become very rare. A last sample of aged seeds with no germinability has been found by the authors in 2006 in an Omani seed store (Gebauer et al. 2007).

The tetraploid naked wheats of Oman are also very interesting; they are very similar to Ethiopian tetraploids and belong to *T. aethiopicum* Jakubz. Earlier, this species was considered endemic to Ethiopia and Yemen. New material was also found in Egypt recently (Gowayed, 2009). The history and evolution of this species have to be revised on the basis of the new findings (Sinskaja, 1969; see also Filatenko et al., 2003).

Vavilov (1931) first distinguished the Ethiopian naked tetraploid wheats as separate subspecies within the species *T. durum* and *T. turgidum*. Percival (1921) had previously included the Ethiopian wheat in *T. dicoccon* on the basis of their similar number of vascular bundles in the coleoptile. Later Vavilov (1964) emphasised the peculiarity of the Ethiopian tetraploid naked wheats (presence of violet-seeded forms, and on the basis of the number of vascular bundles in the coleoptile). Ethiopian wheat is similar to *T.
Costantini (1980) indicates that prehistoric finds of wheat as a crop in Ethiopia now. S. Cleuziou and L. Beytout emphasize, in so doing, their clear distinction from the common types of Ethiopian wheats as close to T. aethiopicum Vav. (see Hanelt and IPK, 2001) and T. turgidum in Oman. But it could be rather T. abyssinicum Vav., (see Hanelt and IPK, 2001) and T. carthlicum. The presence of forms resembling T. aethiopicum subsp. vavilovianum (Dorofeev, Filatenko et al., 1979) was assigned to T. aethiopicum subsp. vavilovianum (Vav.) A. Filat., var. uncinatum (Perciv.) A. Filat., var. amharicum (Perciv.) A. Filat.

The majority of tetraploid naked wheats of Oman belong to T. aethiopicum subsp. vavilovianum. T. aethiopicum Jakubz. subsp. vavilovianum Jakubz. et A. Filat. – Vavilov’s subspecies (description after Dorofeev et al., 1979)

Spikes are medium sized to short (5–9 cm long), moderately dense (D=30–40) or dense (D=40–59), elongated, cylindrical or sometimes pyramidal. Glumes glabrous (shiny or with wax bloom) or pubescent, of various shapes and sizes, delicate or rather coarse in consistency; keel clearly distinct, but comparatively narrow, reaching the base of glume, base without transverse depression and not longitudinally wrinkled. Keel tooth acute, short to awn-like (up to 7 cm long). Caryopses short, orbicular, quite often with hump on dorsal side, white, red or violet. Tuft sparse (stems 2–3), with a small number of subsidiary spikes. Plants quite short. Culm thin, flexible, solid or with a small hollow. Sheath slightly pubescent. Leaf blades scabrous.

Subsp. vavilovianum is divided into two cultivars. Key for the determination of the cultivars of T. aethiopicum subsp. vavilovianum Jakubz. et A. Filat. (key translated from Dorofeev, Filatenko et al. 1979)

1. Spikes cylindrical, 5–9 cm long, dense (D=30–40) cultivar. vavilovianum A. Filat. + Spikes narrowed towards the apex, up to 5 cm long, dense (D>40) cultivar. compactum (Vav.) A. Filat.
The most part of varieties in Oman belongs to convar. \textit{vavilovianum}, less to convar. \textit{compactum}.

Convar. \textit{vavilovianum} – group of dense-spiked varieties.

Out of the 34 described varieties of convar. \textit{vavilovianum}, 11 were discovered in Oman: var. \textit{bialbum} (Vav.) A. Filat., var. \textit{bicolor} (Chiov.) A. Filat., var. \textit{comitans} (Vav.) A. Filat., var. \textit{densimenelikii} (Vav.) A. Filat., var. \textit{mahsanense} A. Filat. et K. Hammer (Filatenko et al. 2010), var. \textit{pilosinigrum} (Vav.) A. Filat. (Al Khanjari et al. 2008), var. \textit{pseudorubripubes} (Vav.) A. Filat. var. \textit{pseudotomentosum} (Perciv.) A. Filat., var. \textit{tchetchericum} (Vav.) A. Filat., var. \textit{tomentosum} (Perciv.) A. Filat. var. \textit{hajirense} A. Filat. et K. Hammer is described below.

Key for the determination of varieties of convar. \textit{vavilovianum} A. Filat. of Oman.

\begin{tabular}{|c|c|c|c|c|c|c|}
\hline
Glumes & Awns & Variety \\
\hline
white & white with black margin & red & red with black margin & black on background & same as glumes & black & \\
\hline
\textit{Spikes awned} & \\
\textit{Spikes glabrous} & \\
\hline
+ & - & - & - & - & + & - & \textit{densimenelikii} \\
- & - & - & - & + & - & + & \textit{bicolor} \\
\hline
\textit{Caryopses white} & \\
\hline
+ & - & - & - & - & + & - & \textit{bialbum} \\
\hline
\textit{Spikes pubescent} & \\
\textit{Caryopses red} & \\
\hline
+ & - & - & - & - & + & - & \textit{tchetchericum} \\
- & - & - & - & + & - & + & \textit{comitans} \\
- & - & + & - & - & + & - & \textit{pseudorubripubes} \\
- & - & - & - & + & - & + & \textit{pilosinigrum} \\
- & - & - & - & + & - & + & \textit{mahsanense} \\
\hline
\textit{Caryopses white} & \\
\hline
+ & + & - & - & - & + & - & \textit{tomentosum} \\
+ & - & - & - & - & + & + & \textit{pseudotomentosum} \\
\hline
\textit{Spikes half-awned} (Spikes pubescent) & \\
\textit{Caryopses white} & \\
\hline
- & - & - & + & - & - & + & \textit{hajirense} \\
\hline
\end{tabular}

\textit{T. aethiopicum} \textit{convar. vavilovianum} var. \textit{hajirense} A. Filat. et K. Hammer, \textit{var. nova} – Spica rubra marginibus glumarum nigris.

Typus: Peninsula Arabica, Oman, cultivar localis Sareea, exped. № 270-3b, districtus Musandam, prope pagus Lkasab, a supra mare 300 m. 2001, leg. S. Alkhanjari and K. Hammer. Herbarium:GAT

Convar. \textit{compactum} A. Filat. – group of extremely dense-spiked varieties.

Out of the 19 described varieties of convar. \textit{compactum}, 3 were discovered in Oman: var. \textit{pseudoarabicum} (Vav.) A. Filat., var. \textit{nubicum} (Vav.) A. Filat., var. \textit{ptolomeae} (Vav.) A. Filat.
Key for the determination of the varieties of *T. aethiopicum* convar. *compactum* (Vav.) A.Filat. in Oman

| Glumes                        | Awns                        | Variety         |
|-------------------------------|-----------------------------|-----------------|
| white                         | same as glumes              | white           |
| with black margin             | black                       | red             |
| red                           | black on background         | on background   |
| red with black margin         | white                       | red             |

**Spikes glabrous**

| Caryopses red |
|---------------|
| +             | –             | –              | –              |
| –             | –             | –              | –              |
| –             | –             | –              | +              | ptolomeum     |

**Spikes pubescent**

| Caryopses red |
|---------------|
| +             | –             | –              | –              |
| –             | –             | –              | –              |
| –             | –             | –              | +              | pseudoarabicum|

**Caryopses white**

| +             | –             | –              | –              | +              | nubicum       |

Among tetraploid accessions some were similar to *T. durum* Desf. (Al Maskri et al., 2003; Al Khanjari et al., 2005). But these forms have a spike more soft and tender, than that of *T. durum*, the culm filling is weak or intermediate in upper internode as with *T. aethiopicum*. Some former determinations could not be confirmed by a new classification done in 2010.

The rich and unique naked hexaploid and tetraploid wheats of Oman testify that wheat is not a casual and recent component of cultural flora of this country, but has an old history of cultivation. Ancient traces of agriculture are found in Arabia in the 3rd millenium BC. The oases of Oman were, at that time, early settlements where early farmers cultivated date palms and sowed distichous and polystichous barley, wheat, sorghum and jujube (Cleuziou and Costantini, 1980). Oman was the important staging post on crossing trade routes which connected Mesopotamia, Persia, the Indus valley and Africa (Shnirelman, 1989).

A wide variation was observed in Dahirah region where cultivated fields were large in size. Batinah region is the second largest in size and number of the fields. Although Batinah is known to have many fields, most fields have been affected by salinity. Sharqia region is spread over a large area but there are few landraces. Farmers in the area cultivate a special type of wheat locally called “Walidi”. The Dakhila region is the smallest region in size with small fields as well. Important landraces and their morphological constituents are shown in Table 2; where a large level of variation can be seen within this region.

In total 29.49% of the local landraces (as expressed by their botanical varieties) have not been reported elsewhere in the world.

| Landrace  | Species        | Botanical varieties                                    |
|-----------|----------------|--------------------------------------------------------|
| „Missani“ | *T. aestivum*  | var. aestivum, var. anglicum, var. arabicum, var. barbarossa, var. hostianum, var. oblivense, var. pseudohostianum, var. soharicum. |
|           | *T.aethiopicum*| var. amharicum, var. comitans, var. densimelikii, var. mahsanense, var. pseudorarum, var. pseudorubropubesens          |
| „Buwaidha“| *T. aestivum*  | var. ptolomeum, var. tchertchericum, var. uncinatum, var. soharicum. |
|           | *T.aethiopicum*| var. comitans, var. densimelikii, var. uncinatum        |
| „Sareea“  | *T. aestivum*  | var. graecum, var. ibræense, var. pseudoerythroleucon    |
|           | *T. compactum*| var. baladseetense, var. sedabense                       |
| „Malki“   | *T.aethiopicum*| var. densimelikii                                       |
|           |                | var. pseudorarum                                       |
Table 2. Contd..

| Landrace         | Species       | Botanical varieties                                      |
|------------------|---------------|----------------------------------------------------------|
| „Sareea“ – „Bulwaidha alwadi“ | *T. aethiopicum* | var. *densimenelikii*                                     |
| „Cooley“         | *T. aestivum* | var. *insigne*, var. *ibraense*, var. *lutesecens*,      |
|                  | *T. compactum*| var. *pseudohostianum*, var. *leucospermum*, var. *meridionale*, var. *hostianum* |
| „Walidi“         | *T. aestivum* | var. *pseudoleucospermum*, var. *pulchrum*, var. *soharicum* |
|                  | *T. compactum*| var. *baladseetense*, var. *multicilinaza*, var. *omanense*, var. *linaza* |
| „Hamira“         | *T. aestivum* | var. *pseudohostianum*, var. *pseudovelutinum*, var. *soharicum* |
|                  | *T. compactum*| var. *baladseetense*                                     |
| „Greda“          | *T. aestivum* | var. var. *graecum*                                      |
| „Shalut“         | *T. aestivum* | var. var. *aestivum*, var. *hostianum*, var. *pseudopyrothrix*, var. *pseudodovelutinum* |
|                  | *T. compactum*| var. var. *multicilinaza*                                 |
| „Shawie“         | *T. aestivum* | var. var. *soharicum*                                    |
| „Khatie“         | *T. aestivum* | var. var. *hostianum*                                    |
| „Grada“          | *T. aestivum* | var. var. *hostianum*, var. *ibraense*, var. *pseudovelutinum*, var. *pseudopyrothrix*, var. *pseudodovelutinum* |
| „Musfsikha“      | *T. aestivum* | var. var. *hostianum*                                    |

Conclusions

Various morphological variations in wheat landraces were found in Oman. Most of the fields were mixed with other cereal crops. Approximately 90% of the wheat fields which were visited contained *Avena sativa* L., and approximately 10-20% contained *Hordeum vulgare* L. These findings confirm earlier reports by Al-Maskri et al. (2003). But a steep decline in the presence of wheat landraces, as already observed by Anon. (2000), has to be confirmed. The speed of transformation processes in the agriculture of oasis settlements of Oman is extremely high (Buerkert et al., 2007; Buerkert and Schlecht, 2010; Gebauer et al., 2010). Many of the small terraces (from 2 to 100 m²; Al-Maskri et al., 2003) have been abandoned. Programs for on-farm conservation of wheat and other genetic resources are urgently needed.

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### Appendix 1. Botanical classification of Oman wheat (A.A. Filatenko, Gatersleben, 2010)

| OMTRI | Probe N | Species         | subspecies      | convar. | subconvar. | varieties                       | Cultivar localis     | Location | Region | District |
|-------|---------|-----------------|-----------------|---------|------------|---------------------------------|----------------------|----------|--------|----------|
| 21    | 180-4   | *T. aestivum* L. | aestivum         |         |            | *soharicum* K. Hammer et A. Filat. | Missani              | Al Gum   | Sur    | Sharqua  |
| 22    | 180-4   | *T. aestivum*   | aestivum         |         |            | *arabicum* K. Hammer et A. Filat. | Missani              | Al Gum   | Sur    | Sharqua  |
| 31    | 104-1   | *T. aestiopicum* Jakubz. | aestiopicum    |         |            | *pseudorarum, pseudorubripubescent* | Missani              | Wadi Sermi Khabura | Khabura | Batinah  |
| 32    | 104-2   | *T. aestiopicum* | aestiopicum     |         |            | *pseudorarum* (Vav.) A. Filat.    | Missani              | Wadi Sermi Khabura | Khabura | Batinah  |
| 33    | 104-4   | *T. aestiopicum* | aestiopicum     |         |            | *schinatium* (Perciv.) A. Filat.  | Buwaidha             | Wadi Sermi Khabura | Khabura | Batinah  |
| 34    | 104-5   | *T. aestiopicum* | aestiopicum     |         |            | *schinatium* (Perciv.) A. Filat.  | Missani              | Wadi Sermi Khabura | Khabura | Batinah  |
| 35    | 104-6-1 | *T. aestiopicum* | vavilovanum Jakubz. et A. Filat. | vavilovanum A. Filat. |            | *comitans* (Vav.) A. Filat.        | Missani              | Wadi Sermi Khabura | Khabura | Batinah  |
| 36    | 104-6-2 | *T. aestiopicum* | vavilovanum     | vavilovanum |            | *comitans* (Vav.) A. Filat.        | Missani              | Wadi Sermi Khabura | Khabura | Batinah  |
| 37    | 106-1   | *T. aestiopicum* | vavilovanum     | vavilovanum |            | *comitans* (Vav.) A. Filat.        | Missani              | Al Zam   | Rustaq | Batinah  |
| 38    | 106-2   | *T. aestiopicum* | vavilovanum     | vavilovanum |            | *comitans* (Vav.) A. Filat.        | Missani              | Al Zam   | Rustaq | Batinah  |
| 39    | 106-3   | *T. aestiopicum* | vavilovanum     | vavilovanum |            | densimenesikii (Vav.) A. Filat.    | Sareea               | Al Zam   | Rustaq | Batinah  |
| 40    | 107-1   | *T. aestiopicum* | vavilovanum     | vavilovanum |            | *comitans* (Vav.) A. Filat.        | Missani              | Al Mahsan | Kharus | Batinah  |
| 41    | 107-2   | *T. aestiopicum* | vavilovanum     | vavilovanum |            | *comitans* (Vav.) A. Filat.        | Missani              | Al Mahsan | Kharus | Batinah  |
| 42    | 107-3   | *T. aestiopicum* | vavilovanum     | vavilovanum |            | *comitans* (Vav.) A. Filat.        | Missani              | Al Mahsan | Kharus | Batinah  |
| 43    | 107-4   | *T. aestiopicum* | vavilovanum     | vavilovanum |            | *comitans* (Vav.) A. Filat.        | Missani              | Al Mahsan | Kharus | Batinah  |
| 44    | 109-5   | *T. aestiopicum* | vavilovanum     | vavilovanum |            | pseudorarum (Vav.) A. Filat.       | Missani              | Wadi Hibi - Al Hajal | Sohar | Batinah  |
| 45    | 109-6   | *T. aestiopicum* | vavilovanum     | vavilovanum |            | *amharicum* (Perciv.) A. Filat.    | Missani              | Wadi Hibi - Al Hajal | Sohar | Batinah  |
| 45-1  | 109-6   | *T. aestiopicum* | vavilovanum     | vavilovanum |            | *amharicum* (Perciv.) A. Filat.    | Missani              | Wadi Hibi - Al Hajal | Sohar | Batinah  |
| 46    | 111-3   | *T. aestivum* hadropyrum (Flaksb.) Tzvel. | semirigidum | A. Filat et Dorof. |            | *semirigidum A. Filat. et Dorof.* | Missani              | Wadi Ahan | Sohar | Batinah  |
| 47    | 111-5   | *T. aestiopicum* | vavilovanum     | vavilovanum |            | *schertchericum, comitans*         | Missani              | Wadi Ahan | Sohar | Batinah  |
| 48    | 112-10  | *T. aestiopicum* | vavilovanum     | vavilovanum |            | *schertchericum* (Vav.) A. Filat.  | Missani              | Wadi Ahan | Sohar | Batinah  |
| 49    | 112-3   | *T. aestiopicum* | vavilovanum     | vavilovanum |            | *schertchericum, comitans*         | Buwaidha             | Wadi Ahan | Sohar | Batinah  |
| 50    | 113-4-1 | *T. aestiopicum* | vavilovanum     | vavilovanum |            | *comitans* (Vav.) A. Filat.        | Missani              | Wadi Ahan | Sohar | Batinah  |
| 51    | 113-4-2 | *T. aestiopicum* | vavilovanum     | vavilovanum |            | *comitans* (Vav.) A. Filat.        | Missani              | Wadi Ahan | Sohar | Batinah  |
| 52    | 113-4-3 | *T. aestiopicum* | vavilovanum     | vavilovanum |            | *comitans* (Vav.) A. Filat.        | Missani              | Wadi Ahan | Sohar | Batinah  |
| Page | Code | Species                      | subspecies             | Location                        | Author                      |
|------|------|-----------------------------|------------------------|---------------------------------|-----------------------------|
| 53   | 120-1| *T. aethiopicum*             |                        |                                 | A. Filatenko and K. Hammer  |
| 54   | 120-6-2| *T. aethiopicum*             | pseudorarum (Vav.)     | Malki Al Raky                   | Wadi Bani Khalid Sharquia  |
| 55   | 120-9| *T. aethiopicum*             | vavilovanum            |                         |                             |
| 56   | 126-7| *T. aestivum*                | vavilovanum            |                                 |                             |
| 57   | 127-4| *T. aestivum*                | vavilovanum            |                                 |                             |
| 58   | 128-1-1| *T. aethiopicum*             | vavilovanum            |                                 |                             |
| 59   | 131-1| *T. aethiopicum*             | vavilovanum            |                                 |                             |
| 60   | 131-2| *T. aethiopicum*             | vavilovanum            |                                 |                             |
| 61   | 132-1-1| *T. aethiopicum*             | compactum (Vav.)       |                                 |                             |
| 62   | 132-1-2| *T. aethiopicum*             | vavilovanum            |                                 |                             |
| 63   | 132-2| *T. aethiopicum*             | vavilovanum            |                                 |                             |
| 64   | 132-3| *T. aethiopicum*             | vavilovanum            |                                 |                             |
| 65   | 138-1| *T. aethiopicum*             | aethiopicum            |                                 |                             |
| 66   | 138-2| *T. aethiopicum*             | aethiopicum            |                                 |                             |
| 67   | 138-4| *T. aethiopicum*             | aethiopicum            |                                 |                             |
| 68   | 140-12-1| *T. aestivum*                | aestivum               |                                 |                             |
| 69   | 140-13-1| *T. aethiopicum*             | aestivum               |                                 |                             |
| 70   | 140-13-2| *T. aethiopicum*             | aestivum               |                                 |                             |
| 71   | 140-25| *T. aethiopicum*             | aestivum               |                                 |                             |
| 72   | 150-1| *T. aestivum*                | hadropyrum             |                                 |                             |
| 73   | 150-2| *T. aestivum*                | hadropyrum             |                                 |                             |
| 74   | 150-4| *T. compactum*               | rigidicompactum        |                                 |                             |
| 75   | 190-5| *T. aethiopicum*             | vavilovanum            |                                 |                             |
| 75-1 | 190-5| *T. aestivum*                | hadropyrum             |                                 |                             |
| 76   | 190-3| *T. aethiopicum*             | vavilovanum            |                                 |                             |
| 77   | 190-4| *T. aethiopicum*             | vavilovanum            |                                 |                             |
| 78   | 190-6| *T. aethiopicum*             | aethiopicum            |                                 |                             |
| 79-1 | 190-7| *T. aestivum*                | hadropyrum             |                                 |                             |
| 79   | 190-7| *T. aethiopicum*             | vavilovanum            |                                 |                             |
| 80   | 190-8| *T. aestivum*                | aestivum               |                                 |                             |
| Page | Line | Species Information                                                                 |
|------|------|-------------------------------------------------------------------------------------|
| 81   | 270-3 | *T. aethiopicum* *vavilovianum* *vavilovianum* comitans (Vav.) A. Filat. Missani Lima Lima Musandam |
| 82-1 | 270-2 | *T. aestivum* hadropyrum semirigidum semirigidum pseudohostianum (Flaksb.) Mansf. Missani Lima Lima Musandam |
| 82   | 270-2 | *T. aethiopicum* *vavilovianum* *vavilovianum* schertchericum (Vav.) A. Filat. Missani Lima Lima Musandam |
| 87   | 107-4 | *T. compactum* Host rigidicompactum (Kudr.) Dorof. et A. Filat. maticilinaza Kudr. Cooley Al Mahsan Wadi Bani Kharus Batinah |
| 88   | 109-1 | *T. compactum* compactum baladseitense (Hm. et A. Filat.) Filat. Cooley Wadi Hibi - Al Hajar Sohar Batinah |
| 89   | 109-2 | *T. compactum* rigidicompactum rigidicompactum maticilinaza Kudr. Walidi Wadi Hibi - Al Hajar Sohar Batinah |
| 89-1 | 109-2-6 | *T. aestivum* hadropyrum semirigidum semirigidum leucospermum (Koern.) Mansf. Walidi Wadi Hibi - Al Hajar Sohar Batinah |
| 90   | 109-3 | *T. aestivum* aestivum soharicum K. Hammer et A. Filat. Hamira Wadi Hibi - Al Hajar Sohar Batinah |
| 91   | 109-10 | *T. aestivum* aestivum soharicum K. Hammer et A. Filat. Walidi Wadi Hibi - Al Hajar Sohar Batinah |
| 92   | 111-1 | *T. aestivum* hadropyrum semirigidum semirigidum euraecum (Koern.) Mansf. Greda Wadi Ahan Sohar Batinah |
| 93   | 111-4 | *T. aestivum* aestivum soharicum K. Hammer et A. Filat. Walidi Wadi Ahan Sohar Batinah |
| 94   | 111-6 | *T. compactum* luizi Koern. Cooley Wadi Ahan Sohar Batinah |
| 95   | 111-7 | *T. aestivum* hadropyrum semirigidum semirigidum leucospermum (Koern.) Mansf. Cooley Wadi Ahan Sohar Batinah |
| 96   | 111-8-1| *T. aestivum* aestivum soharicum K. Hammer et A. Filat. Shalut Wadi Ahan Sohar Batinah |
| 97   | 111-8-2| *T. aestivum* aestivum soharicum K. Hammer et A. Filat. Shalut Wadi Ahan Sohar Batinah |
| 98   | 111-9 | *T. aestivum* aestivum soharicum K. Hammer et A. Filat. Hamira Wadi Ahan Sohar Batinah |
| 99   | 111-10(112-11) | *T. compactum* compactum baladseitense (Hm. et Filat.) A. Filat. Hamira Wadi Ahan Sohar Batinah |
| 100  | 112-1 | *T. compactum* compactum maqatense A. Filat. et Hammer Walidi Wadi Ahan Sohar Batinah |
| 101  | 113-1 | *T. aestivum* hadropyrum semirigidum semirigidum ibraense K. Hammer et A. Filat. Cooley Wadi Ahan Sohar Batinah |
| 102  | 113-10| *T. aestivum* hadropyrum semirigidum pseudohostianum (Kudr.) A. Filat. Cooley Wadi Ahan Sohar Batinah |
| 103  | 113-11| *T. aestivum* hadropyrum semirigidum semirigidum pulchrum (Kudr.) A. Filat. Walidi Wadi Ahan Sohar Batinah |
| 104  | 113-12| *T. aestivum* hadropyrum semirigidum semirigidum pulchrum (Kudr.) A. Filat. Walidi Wadi Ahan Sohar Batinah |
| 105  | 113-5 | *T. aestivum* hadropyrum semirigidum hostianum (Clem.) Mansf. Missani Wadi Ahan Sohar Batinah |
| 106  | 113-6 | *T. aestivum* hadropyrum semirigidum hostianum (Clem.) Mansf. Hamira Wadi Ahan Sohar Batinah |
| 107  | 113-7 | *T. aestivum* hadropyrum semirigidum hostianum (Clem.) Mansf. Hamira Wadi Ahan Sohar Batinah |
| 108  | 115-1 | *T. compactum* rigidicompactum rigidicompactum sedabense A. Filat. et K. Hammer Cooley Buai reefa IBri Dibihira |
| 109  | 115-2 | *T. aestivum* aestivum lutescens (Alef.) Mansf. Cooley Buai reefa IBri Dibihira |
| 110  | 115-4 | *T. aestivum* hadropyrum semirigidum semirigidum ibraense K. Hammer et A. Filat. Cooley Buai reefa IBri Dibihira |
| 111  | 115-5 | *T. aestivum* hadropyrum semirigidum semirigidum ibraense K. Hammer et A. Filat. Cooley Buai reefa IBri Dibihira |
| 112  | 115-6 | *T. aestivum* hadropyrum semirigidum semirigidum ibraense K. Hammer et A. Filat. Cooley Buai reefa IBri Dibihira |
| Page | Line | Text |
|------|------|------|
| 113  | 115-7| *T. aestivum* *hadropyrum* *semirigidum* *semirigidum* *pseudohostianum* (Flaksb.) Mansf. |
| 114  | 120-11| *T. aestivum* *hadropyrum* *semirigidum* *semirigidum* *pseudoeothypospermum* (Kudr.) A.Filat. |
| 115  | 120-12| *T. aestivum* *hadropyrum* *semirigidum* *semirigidum* *ibraense* K.Hammer et A.Filat. |
| 116  | 120-13-1| *T. aestivum* *hadropyrum* *semirigidum* *semirigidum* *leucospermum* (Koern.) Mansf. |
| 117  | 120-13-2| *T. aestivum* *hadropyrum* *semirigidum* *semirigidum* *ibraense* (compactoid) |
| 118  | 120-6-1| *T. aestivum* *hadropyrum* *semirigidum* *semirigidum* *hostianum* (Clem.) Mansf. |
| 119  | 120-7-1| *T. compactum* *rigidicompactum* *rigidicompactum* *sedabense* K. Hammer et A. Filat. |
| 120  | 120-7-2| *T. compactum* *rigidicompactum* *rigidicompactum* *matriciluzna* Kudr. |
| 121  | 120-5-1| *T. aestivum* *hadropyrum* *semirigidum* *semirigidum* *leucospermum* (Koern.) Mansf. |
| 122  | 120-4(120-5-2)| *T. aestivum* *hadropyrum* *semirigidum* *semirigidum* *pulchrum* (Kudr.) A. Filat. |
| 123  | 120-3| *T. aestivum* *hadropyrum* *semirigidum* *semirigidum* *hostianum* (Clem.) Mansf. |
| 124  | 120-(120-4-1)| *T. aestivum* *hadropyrum* *semirigidum* *semirigidum* *leucospermum* (Koern.) Mansf. |
| 125  | 121-(120-4-2)| *T. compactum* *rigidicompactum* *rigidicompactum* *sedabense* (Filat. et Hm.) A. Filat. |
| 126  | 121-2(121-1)| *T. compactum* *compactum* *compactum* *bulatsetense* (Filat. et Hm.) A. Filat. |
| 127  | 121-3| *T. compactum* *compactum* *compactum* *bulatsetense* (Hm. et Filat.) A. Filat. |
| 128  | 121-4| *T. compactum* *compactum* *compactum* *bulatsetense* (Hm. et Filat.) A. Filat. |
| 128-1| 121-4,5| *T. aestivum* *aestivum* *aestivum* *aestivum* |
| 129  | 121-5| *T. compactum* *compactum* *compactum* *bulatsetense* (Hm. et Filat.) A. Filat. |
| 130  | 122-1| *T. compactum* *compactum* *compactum* *bulatsetense* (Hm. et Filat.) A. Filat. |
| 131  | 126-1| *T. compactum* *rigidicompactum* *rigidicompactum* *matriciluzna* Kudr. |
| 132  | 126-2| *T. compactum* *rigidicompactum* *rigidicompactum* *matriciluzna* Kudr. |
| 133  | 126-3| *T. aestivum* *aestivum* *soharicum* K. Hammer et A. Filat. |
| 134  | 126-6| *T. aestivum* *aestivum* *aestivum* *soharicum* K. Hammer et A. Filat. |
| 135  | 127-1-1| *T. compactum* *rigidicompactum* *rigidicompactum* *matriciluzna* Kudr. |
| 136  | 127-1-2| *T. aestivum* *hadropyrum* *semirigidum* *semirigidum* *pseudoeothypospermum* (Kob.) Mansf. |
| 137  | 127-2-1| *T. aestivum* *hadropyrum* *semirigidum* *semirigidum* *pseudoeothypospermum* (Kob.) Mansf. |
|   |   |   |   |   |   |   |   |   |
|---|---|---|---|---|---|---|---|---|
|138|127-2-2|T. aestivum|hadropyrum|semirigidum|semirigidum|pseudoleucospermum (Kob.) Mansf. |Cooley |Falaj Sudairen |Yanqul |Dhahira |
|139|127-3|T. aestivum|hadropyrum|semirigidum|semirigidum|pseudoleucospermum (Kob.) Mansf. |Cooley |Falaj Sudairen |Yanqul |Dhahira |
|141|127-6|T. aestivum|hadropyrum|semirigidum|semirigidum|leucospermum (Koern.) Mansf. |Cooley |Falaj Sudairen |Yanqul |Dhahira |
|142|128-10-1|T. compactum|rigidicompactum|rigidicompactum|maticillinaza Kudr. |Cooley |Bahla |Bahla |Dakhilia |
|143|128-10-2|T. compactum|rigidicompactum|rigidicompactum|maticillinaza Kudr. |Cooley |Bahla |Bahla |Dakhilia |
|144|128-10-3|T. aestivum|hadropyrum|semirigidum|semirigidum|leucospermum (Koern.) Mansf. |Cooley |Bahla |Bahla |Dakhilia |
|145|128-11|T. aestivum|hadropyrum|semirigidum|semirigidum|leucospermum (Koern.) Mansf. |Cooley |Bahla |Bahla |Dakhilia |
|146|128-1-2|T. compactum|rigidicompactum|rigidicompactum|maticillinaza Kudr. |Cooley |Bahla |Bahla |Dakhilia |
|147|128-2|T. compactum|rigidicompactum|rigidicompactum|maticillinaza Kudr. |Cooley |Bahla |Bahla |Dakhilia |
|147-1|128-2|T. aestivum|hadropyrum|semirigidum|semirigidum|leucospermum (Koern.) Mansf. |Cooley |Bahla |Bahla |Dakhilia |
|148|128-2-2|T. aestivum|aestivum|aestivum|aestivum|Shalut |Bahla |Bahla |Dakhilia |
|149|100-1|T. compactum|rigidicompactum|rigidicompactum|omanense A. Filat. et K. Hammer |Cooley |Iraqi |Ibri |Dhahira |
|150|100-1-1|T. compactum|rigidicompactum|rigidicompactum|omanense A. Filat. et K. Hammer |Cooley |Iraqi |Ibri |Dhahira |
|151|100-1-2|T. aestivum|aestivum|aestivum|aestivum|omanense A. Filat. et K. Hammer |Cooley |Iraqi |Ibri |Dhahira |
|152|100-1-3|T. aestivum|hadropyrum|semirigidum|semirigidum|meridionale (Koern.) Mansf. |Cooley |Iraqi |Ibri |Dhahira |
|153|100-1-6|T. aestivum|hadropyrum|semirigidum|semirigidum|lebraense K.Hammer et A.Filat. |Cooley |Iraqi |Ibri |Dhahira |
|155|100-3|T. aestivum|aestivum|aestivum|aestivum|omanense A. Filat. et K. Hammer |Cooley |Iraqi |Ibri |Dhahira |
|158|100-7|T. aestivum|aestivum|aestivum|aestivum|omanense A. Filat. et K. Hammer |Cooley |Iraqi |Ibri |Dhahira |
|158|100-7|T. compactum|compactum|compactum|baladseetense (Hm. et Filat.) A. Filat. |Hamira |Iraqi |Ibri |Dhahira |
|160|100-9|T. compactum|rigidicompactum|rigidicompactum|omanense A. Filat. et K. Hammer |Cooley |Iraqi |Ibri |Dhahira |
|161|100-6-1|T. aestivum|hadropyrum|semirigidum|semirigidum|leucospermum (Koern.) Mansf. |Cooley |Iraqi |Ibri |Dhahira |
|162|100-6-2|T. aestivum|hadropyrum|semirigidum|semirigidum|leucospermum (Koern.) Mansf. |Cooley |Iraqi |Ibri |Dhahira |
|163|101-1|T. aestivum|aestivum|aestivum|aestivum|omanense A. Filat. et K. Hammer |Cooley |Iraqi |Ibri |Dhahira |
|164|101-2|T. capitatum|compactum|compactum|baladseetense K. Hammer et A. Filat. |Hamira |Iraqi |Ibri |Dhahira |
|165|101-3|T. compactum|compactum|compactum|baladseetense K. Hammer et A. Filat. |Hamira |Iraqi |Ibri |Dhahira |
|166|101-4|T. aestivum|aestivum|aestivum|aestivum|omanense A. Filat. et K. Hammer |Cooley |Iraqi |Ibri |Dhahira |
|167|101-5|T. aestivum|aestivum|aestivum|aestivum|omanense A. Filat. et K. Hammer |Cooley |Iraqi |Ibri |Dhahira |
|168|128-3|T. aestivum|aestivum|aestivum|aestivum|omanense A. Filat. et K. Hammer |Cooley |Bahla |Bahla |Dakhilia |
|169|128-4|T. aestivum|hadropyrum|semirigidum|semirigidum|leucospermum (Koern.) Mansf. |Cooley |Bahla |Bahla |Dakhilia |
|170|128-5|T. aestivum|hadropyrum|semirigidum|semirigidum|leucospermum (Koern.) Mansf. |Cooley |Bahla |Bahla |Dakhilia |
| Page | 128-6 | 131-2-1 | 171-174 | 175-178 | 181-184 | 185-188 | 189-192 | 193-196 | 197-199 |
|------|-------|---------|---------|---------|---------|---------|---------|---------|---------|
| 171  | T. aestivum | hadropyrum | semirigidum | semirigidum | leucospermum (Koern.) Mansf. | Cooley | Bahla | Bahla | Dakhilia |
| 172  | T. aestivum | hadropyrum | semirigidum | semirigidum | leucospermum (Koern.) Mansf. | Cooley | Bahla | Bahla | Dakhilia |
| 173  | T. aestivum | hadropyrum | semirigidum | semirigidum | leucospermum (Koern.) Mansf. | Cooley | Qemat | Barut | Qemat | Barut | Qemat | Barut | Qemat | Barut | Qemat | Barut |
| 174  | T. aestivum | hadropyrum | semirigidum | semirigidum | leucospermum (Koern.) Mansf. | Cooley | Qemat | Barut | Qemat | Barut | Qemat | Barut | Qemat | Barut | Qemat | Barut |
| 174-1 | T. compactum | rigidicompactum | rigidicompactum | maticillinuzu Kudr. | Cooley | Qemat | Barut | Qemat | Barut | Qemat | Barut | Qemat | Barut | Qemat | Barut | Qemat | Barut |
| 175  | T. aestivum | hadropyrum | semirigidum | semirigidum | ibraense K.Hammer et A.Filat. | Cooley | Qemat | Barut | Bahla | Dakhilia |
| 176  | T. aestivum | hadropyrum | semirigidum | semirigidum | pulchrum (Kudr.) A. Filat. | Shuaira | Qemat | Barut | Bahla | Dakhilia |
| 177  | T. aestivum | hadropyrum | semirigidum | semirigidum | pseudoleucospermum | Cooley | Qemat | Barut | Bahla | Dakhilia |
| 178  | T. aestivum | hadropyrum | semirigidum | semirigidum | leucospermum (Koern.) Mansf. | Shuaira | Qemat | Barut | Bahla | Dakhilia |
| 179  | T. aestivum | hadropyrum | semirigidum | semirigidum | ibraense K.Hammer et A.Filat. | Shuaira | Qemat | Barut | Bahla | Dakhilia |
| 180  | T. aestivum | hadropyrum | semirigidum | semirigidum | pulchrum | Cooley | Qemat | Barut | Bahla | Dakhilia |
| 181  | T. compactum | compactum | compactum | buladseetense (Hm. et Filat.) A. Filat. | Walidi | Maqta | Taeen | Sharquia |
| 182  | T. compactum | compactum | compactum | buladseetense (Hm. et Filat.) A. Filat. | Walidi | Maqta | Taeen | Sharquia |
| 183  | T. compactum | compactum | compactum | buladseetense (Hm. et Filat.) A. Filat. | Walidi | Maqta | Taeen | Sharquia |
| 184  | T. compactum | compactum | compactum | buladseetense (Hm. et Filat.) A. Filat. | Walidi | Maqta | Taeen | Sharquia |
| 185  | T. compactum | compactum | compactum | buladseetense (Hm. et Filat.) A. Filat. | Walidi | Maqta | Taeen | Sharquia |
| 186  | T. compactum | compactum | compactum | buladseetense (Hm. et Filat.) A. Filat. | Walidi | Maqta | Taeen | Sharquia |
| 187  | T. compactum | compactum | compactum | buladseetense (Hm. et Filat.) A. Filat. | Walidi | Maqta | Taeen | Sharquia |
| 188  | T. compactum | compactum | compactum | buladseetense (Hm. et Filat.) A. Filat. | Walidi | Maqta | Taeen | Sharquia |
| 189  | T. compactum | compactum | compactum | buladseetense (Hm. et Filat.) A. Filat. | Walidi | Maqta | Taeen | Sharquia |
| 190  | T. compactum | compactum | compactum | buladseetense (Hm. et Filat.) A. Filat. | Walidi | Maqta | Taeen | Sharquia |
| 191  | T. compactum | compactum | compactum | buladseetense (Hm. et Filat.) A. Filat. | Walidi | Maqta | Taeen | Sharquia |
| 192  | T. compactum | compactum | compactum | buladseetense (Hm. et Filat.) A. Filat. | Walidi | Maqta | Taeen | Sharquia |
| 193  | T. compactum | compactum | compactum | buladseetense (Hm. et Filat.) A. Filat. | Walidi | Maqta | Taeen | Sharquia |
| 194  | T. compactum | compactum | compactum | buladseetense (Hm. et Filat.) A. Filat. | Walidi | Maqta | Taeen | Sharquia |
| 195  | T. compactum | compactum | compactum | buladseetense (Hm. et Filat.) A. Filat. | Walidi | Maqta | Taeen | Sharquia |
| 196  | T. compactum | compactum | compactum | buladseetense (Hm. et Filat.) A. Filat. | Walidi | Maqta | Taeen | Sharquia |
| 197  | T. compactum | compactum | compactum | buladseetense (Hm. et Filat.) A. Filat. | Walidi | Maqta | Taeen | Sharquia |
| 198  | T. compactum | compactum | compactum | buladseetense (Hm. et Filat.) A. Filat. | Walidi | Maqta | Taeen | Sharquia |
| 199  | T. compactum | compactum | compactum | buladseetense (Hm. et Filat.) A. Filat. | Walidi | Maqta | Taeen | Sharquia |

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| Page | 140-6(140-13) | T. aethiopicum vavilovianum vavilovianum semirigidum semirigidum | densimenelikii (Vav.)A.Filat. | Cooley | Falaj Sudairen | Yanqul | Dhihira |
|------|---------------|---------------------------------------------------------------|-----------------------------|--------|----------------|-------|-------|
| 201  | 140-17        | T. aestivum hadropyrum semirigidum semirigidum pseudoreutheroperum(Kudr.) Mansf. | Cooley | Shalut | Falaj Sudairen | Yanqul | Dhihira |
| 202  | 140-19        | T. aestivum hadropyrum semirigidum semirigidum | A.Filat. | Shalut | Falaj Sudairen | Yanqul | Dhihira |
| 203  | 140-2         | T. compactum rigidicompactum rigidicompactum | omanensae A. Filat. et K. Hammer | Cooley | Falaj Sudairen | Yanqul | Dhihira |
| 204  | 140-21        | T. aestivum hadropyrum semirigidum semirigidum hostianum(Clem.) Mansf. | Cooley | Falaj Sudairen | Yanqul | Dhihira |
| 205  | 140-22-1      | T. aestivum aestival | soharicum K. Hammer et A.Filat. | Shuaira | Falaj Sudairen | Yanqul | Dhihira |
| 207  | 140-23        | T. aestivum hadropyrum semirigidum semirigidum pseudovelutinum (Kob.) Mansf. | Cooley | Falaj Sudairen | Yanqul | Dhihira |
| 208  | 140-24        | T. aestivum hadropyrum semirigidum semirigidum pulchrum (Kudr.) A. Filat. | Grade | Falaj Sudairen | Yanqul | Dhihira |
| 209  | 140-26-1      | T. aestival | aestival | pseudoerythrospermum (Kudr.) A.Filat. | Hamira | Falaj Sudairen | Yanqul | Dhihira |
| 210  | 140-26-2      | T. aestival hadropyrum semirigidum semirigidum | pseudoerythrospermum (Kudr.) A.Filat. | Hamira | Falaj Sudairen | Yanqul | Dhihira |
| 212  | 140-4-1       | T. aestival hadropyrum semirigidum semirigidum | pseudoleucospermum (Kob.) Mansf. | Cooley | Falaj Sudairen | Yanqul | Dhihira |
| 213  | 140-4-2       | T. compactum rigidicompactum rigidicompactum | sedabense A. Filat. et K. Hammer | Cooley | Falaj Sudairen | Yanqul | Dhihira |
| 214  | 140-5         | T. aestival hadropyrum semirigidum semirigidum leucospermum (Koern.) Mansf. | Cooley | Falaj Sudairen | Yanqul | Dhihira |
| 215  | 140-7         | T. aestival hadropyrum semirigidum semirigidum leucospermum (Koern.) Mansf. | Cooley | Falaj Sudairen | Yanqul | Dhihira |
| 216  | 140-8         | T. aestival hadropyrum semirigidum semirigidum leucospermum (Koern.) Mansf. | Cooley | Falaj Sudairen | Yanqul | Dhihira |
| 217  | 140-9-1       | T. aestival hadropyrum semirigidum semirigidum leucospermum (Koern.) Mansf. | Cooley | Falaj Sudairen | Yanqul | Dhihira |
| 218  | 140-9-2       | T. aestival hadropyrum semirigidum semirigidum ibraense K. Hammer et A.Filat. | Cooley | Falaj Sudairen | Yanqul | Dhihira |
| 219  | 150-3         | T. aestival hadropyrum semirigidum semirigidum insigne (Kudr.) A.Filat. | Cooley | Wadi Ahan | Ibi | Dhihira |
| 220  | 150-5         | T. aestival hadropyrum semirigidum semirigidum ibraense K. Hammer et A.Filat. | Cooley | Wadi Ahan | Ibi | Dhihira |
| 221  | 150-6         | T. compactum rigidicompactum rigidicompactum muticilinaza Kudr. | Cooley | Wadi Ahan | Ibi | Dhihira |
| 222  | 143           | T. compactum compactum | buladaeetense K. Hammer et A. Filat. | Walidi | Hadas | Taeen | Sharquia |
| 223  | 102-1         | T. aestival aestival | soharicum K. Hammer et A.Filat. | Hamira | Khader | Makattim | Khabura | Batinah |
| 224  | 102-2         | T. aestival aestival | soharicum K. Hammer et A.Filat. | Hamira | Khader | Makattim | Khabura | Batinah |
| 225  | 102-3         | T. aestival aestival | soharicum K. Hammer et A.Filat. | Hamira | Khader | Makattim | Khabura | Batinah |
| 226  | 103-1         | T. aestival aestival | soharicum K. Hammer et A.Filat. | Hamira | Al Khad | Khabura | Batinah |
| 227  | 103-2         | T. aestival aestival | soharicum K. Hammer et A.Filat. | Hamira | Al Khad | Khabura | Batinah |
| 228  | 103-3         | T. aestival aestival | soharicum K. Hammer et A.Filat. | Hamira | Al Khad | Khabura | Batinah |
| 229  | 103-4         | T. aestival hadropyrum semirigidum semirigidum ibraense K. Hammer et A.Filat. | Hamira | Al Khad | Khabura | Batinah |
| 230  | 180-2         | T. aestival hadropyrum semirigidum semirigidum pseudohostianum (Flaksb.) Mansf. | Missani | Al Gum | Sur | Sharquia |
| 231  | 180-3         | T. aethiopicum vavilovianum vavilovianum | tchertchericum (Vav.)A.Filat. | Missani | Al Gum | Sur | Sharquia |
| 232  | 116-1         | T. compactum rigidicompactum rigidicompactum muticilinaza Kudr. | Cooley | Ibi | Ibi | Dhihira |
| Page | Description |
|------|-------------|
| 116-2 | *T. compactum* rigidicompactum rigidicompactum muticilinaza Kudr. Cooley Ibi Ibi Dhihira |
| 116-3 | *T. compactum* rigidicompactum rigidicompactum pseudoerythrospermum (Kudr.) A. Filat. Sareea Ibi Ibi Dhihira |
| 116-4 | *T. aestivum* hadropyrum semirigidiun semirigidiun pseudoeleucuspermum (Kob.) Mansf. Walidi big size Al Drize Ibi Dhihira |
| 117-1 | *T. aestivum* hadropyrum semirigidiun semirigidiun pseudoeleucuspermum (Kob.) Mansf. Walidi big size with awns Al Drize Ibi Dhihira |
| 117-2 | *T. aestivum* hadropyrum semirigidiun semirigidiun pseudoeleucuspermum (Kob.) Mansf. Cooley Al Drize Ibi Dhihira |
| 118-1 | *T. aestivum* hadropyrum semirigidiun semirigidiun pseudoleucospermum (Kob.) Mansf. Cooley Al Drize Ibi Dhihira |
| 118-2 | *T. aestivum* aestivum soharicum K. Hammer et A. Filat. Sareea Al Drize Ibi Dhihira |
| 119-1 | *T. compactum* rigidicompactum rigidicompactum sedabense A. Filat. et K. Hammer Cooley Yanqul Yanqul Dhihira |
| 119-2 | *T. aestivum* hadropyrum semirigidiun semirigidiun pseudoeleucuspermum (Kob.) Mansf. Cooley Yanqul Yanqul Dhihira |
| 119-3-1 | *T. aestivum* hadropyrum semirigidiun semirigidiun leucospermum (Koern.) Mansf. Cooley Yanqul Yanqul Dhihira |
| 119-3-2 | *T. aestivum* hadropyrum semirigidiun semirigidiun leucospermum, ibraense Shuaira Al Hajiar Batinah Wadi Bani Kharus Batinah |
| 119-3-3 | *T. aestivum* hadropyrum semirigidiun semirigidiun ibraenuse K. Hammer et A. Filat. Shuaira Yanqul Yanqul Batinah |
| 119-3-4 | *T. aestivum* hadropyrum semirigidiun semirigidiun ibraenuse K. Hammer et A. Filat. Greda Al Hajiar Wadi Bani Kharus Batinah |
| 121-1 | *T. aestivum* hadropyrum semirigidiun semirigidiun ibraenuse K. Hammer et A. Filat. Greda Al Hajiar Wadi Bani Kharus Batinah |
| 123-1 | *T. aestivum* hadropyrum semirigidiun semirigidiun ibraenuse K. Hammer et A. Filat. Greda Al Hajiar Wadi Bani Kharus Batinah |
| 123-2 | *T. compactum* rigidicompactum rigidicompactum maticilinaza Kudr. Shuaira Al Hajiar Wadi Bani Kharus Batinah |
| 123-3-1 | *T. aestivum* hadropyrum semirigidiun semirigidiun pseudoeleucuspermum (Kob.) Mansf. Hamira Al Hajiar Wadi Bani Kharus Batinah |
| 123-3-2 | *T. aestivum* hadropyrum semirigidiun semirigidiun leucospermum, ibraenuse Shuaira Al Hajiar Wadi Bani Kharus Batinah |
| 123-4 | *T. aestivum* hadropyrum semirigidiun semirigidiun graecum (Koern.) Mansf. Shuaira Al Hajiar Wadi Bani Kharus Batinah |
| 123-5-1 | *T. aestivum* hadropyrum semirigidiun semirigidiun ibraenuse K. Hammer et A. Filat. Cooley Al Hajiar Wadi Bani Kharus Batinah |
| 123-5-2 | *T. aestivum* hadropyrum semirigidiun semirigidiun hostianum (Clem.) Mansf. Greda Al Hajiar Wadi Bani Kharus Batinah |
| 124-1 | *T. aestivum* hadropyrum semirigidiun semirigidiun hostianum (Clem.) Mansf. Dhan Kharus Dhan Kharus Dhihira |
| 124-2 | *T. aestivum* hadropyrum semirigidiun semirigidiun hostianum (Clem.) Mansf. Dhan Kharus Dhan Kharus Dhihira |
| 124-3 | *T. aestivum* hadropyrum semirigidiun semirigidiun pulchrum (Kudr.) A. Filat. Shuaira Dhan Kharus Dhan Kharus Dhihira |
| 124-4-1 | *T. aestivum* hadropyrum semirigidiun semirigidiun leucospermum (Koern.) Mansf. Cooley Dhan Kharus Dhan Kharus Dhihira |
| 124-4-2 | *T. aestivum* aestivum soharicum K. Hammer et A. Filat. Cooley Dhan Kharus Dhan Kharus Dhihira |
| 124-5-1 | *T. aestivum* hadropyrum semirigidiun semirigidiun ibraenuse K. Hammer et A. Filat. Cooley Dhan Kharus Dhan Kharus Dhihira |
| 124-5-2 | *T. aestivum* hadropyrum semirigidiun semirigidiun leucospermum (Koern.) Mansf. Cooley Dhan Kharus Dhan Kharus Dhihira |
| 125 | *T. compactum* compactum maqtaense (Filat. et Hm.) A. Filat. ? |
| 126 | *T. aestivum* hadropyrum semirigidiun semirigidiun graecum (Koern.) Mansf. Jabal Al Akhbar |