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Cover: Omani farmer threshing landrace wheat that will then be used by his family. The remaining straw is used as feed for ruminants. Buerkert et al (pp. 7-10) discuss their Oman wheat landrace survey findings. Photo: Dr Andreas Buerkert.

Couverture : Battage d'une race locale de blé à Oman. Le grain nourrira la famille de l'agriculteur et la paille servira de fourrage pour les ruminants. Buerkert et al (pp. 7-10) discutent les résultats de leur inventaire sur les races locales de blé à Oman. Photo: Dr Andreas Buerkert.

Portada: Campesino omaní trillando trigo nativo para el consumo de su familia. La paja restante se utiliza como forraje para los ruminantes. Buerkert et al (pág. 7-10) discuten el resultado de sus estudios sobre el trigo nativo omaní. Foto: Dr Andreas Buerkert.

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A survey of wheat landraces in Oman

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Summary

A survey of wheat landraces in Oman

Little is known about the diversity of wheat (*Triticum* spp.) in Oman. Therefore, a survey was conducted in northern Oman to collect landraces of *Triticum durum*, *T. aestivum* and *T. dicoccon* for subsequent morphological characterization and investigations on stress adaptation. The results show that the cultivation of these landraces (the genetic composition of which remains to be studied in more detail) is done primarily by traditional farmers who preserve the inherited germplasm on often tiny plots in remote mountain oases. This type of traditional cultivation is under heavy economic pressure. An appendix of landraces of other crops collected in the Batinah region and in the mountain oases can be found online.

Key words: Indigenous knowledge, landraces, mountain agriculture, *Triticum aestivum*, *T. dicoccon*, *T. durum*

Résumé

Inventaire des races locales de blé à Oman

La diversité du blé (*Triticum* spp.) à Oman est mal connue. Un inventaire a donc été effectué dans le Nord d'Oman afin de collecter des races locales de *Triticum durum*, *T. aestivum* et *T. dicoccon* en vue de leur caractérisation morphologique et d'études de leur adaptation au stress. Les résultats montrent que ces races locales (dont la composition génétique reste à étudier avec plus de précision) sont principalement cultivées par des agriculteurs traditionnels qui conservent cette ressource génétique, souvent sur de très petites parcelles, dans des oasis de montagne peu accessibles. Ce type de culture traditionnelle est soumis à une très forte pression économique. Une liste des races locales d'autres plantes cultivées, collectées dans la région de Batinah et dans les oasis de montagne, peut être consultée en ligne.

Resumen

Un examen de las landraces de trigo en Oman

Se conoce poco acerca de la diversidad del trigo (*Triticum* spp.) en Oman. Debido a esto, se realizó un examen en Oman septentrional para recolectar landraces de *Triticum durum*, *T. aestivum* y *T. dicoccon* para su subsiguiente caracterización morfológica y la investigación de su adaptación al estrés. Los resultados muestran que el cultivo de estas landraces (cuya composición genética aún tiene que ser estudiada con mayor detalle), lo llevan a cabo principalmente los campesinos tradicionales, que conservan el germoplasma heredado, a menudo en pequeñas fincas de oasis montañosos remotos. Este tipo de cultivo tradicional se encuentra bajo fuerte presión económica. También puede consultarse en Internet un apéndice sobre las landraces de otros cultivos recogidos en la región Batinah y en los oasis montañosos.

Introduction

With its ancient history of cultivating both bread wheat, *Triticum aestivum* L. s.l, and durum wheat, *T. durum* Desf. (Schwartz 1939; Guarino 1990), Oman has recently come to the attention of scientists interested in agro-biodiversity (Al-Maskri et al. 2003). Collection missions conducted through the Omani Ministry of Agriculture have shown that farmers practicing traditional oasis agriculture continue to cultivate a number of wheat landraces, namely, 'Sarraya', 'Walidi', 'Cooley', 'Greda', 'Missani' and 'Hamira'. However, the area planted to these landraces declined from about 1000 hectares (ha) in 1988 to 240 ha in 1996. Major reasons for this decline were the adoption of higher-yielding modern varieties, increasing soil salinity in the wheat producing Batinah region, and the abandonment of marginal cultivation sites in remote mountain villages following grain imports from Australia (Akhtar 1981; Toll and Moss 1995; Anonymous 2000). During the morphological evaluation of wheat germplasm in landraces from farmers' fields in two mountain oases of the Jabal Akhdar mountains and the Wadi Khabbah of the Al-Hajar Ash'sharqi range, two new botanical varieties of *T. aestivum* were discovered (Al-Maskri et al 2003). While this material is currently being further investigated using micro-satellite techniques and drought stress experiments to characterize it into more detail, a formal field survey

covering four regions of northern Oman was conducted to (i) explore farmers' cultivation practices for wheat landraces, (ii) record local names for these landraces, and (iii) to collect wheat landraces. Other crops have also been included in the exploration programme (Appendix 1 [online]).

Materials and methods

This survey was conducted during March 2002 and covered twelve sites within four regions of northern Oman (see Figure 1). The survey comprises a total of 69 interviews, which lasted from 9 to 27 March 2002 and covered the following four regions of northern Oman (Figure 1):

- (i) the 'Interior' with Al-Hamra, Misfat Al-Abrein, Bahla and Jabal Akhdar (18 farmers interviewed);
- (ii) the 'Southern Batinah' area with Balad Seet, Wadi Mistal, Wadi Bani Kharus, Wadi Sahtain and Al-Awabi (24 farmers);
- (iii) the 'Sharquia' with Ibra and Wadi Dama Wa Taeen region (24 farmers);
- (iv) the 'Al-Quraiat' area with Hubaina (3 farmers).

To identify those inhabitants who still cultivated Omani wheat landraces, informal talks were first conducted with village elders in the areas under study (Plate 1).

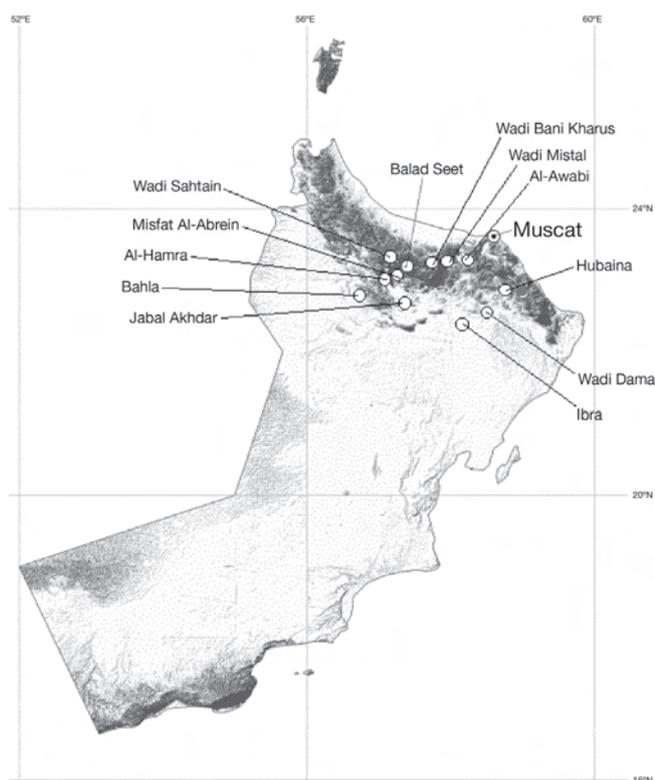


Figure 1. Map of Oman indicating the survey area: the 'Interior' - Al-Hamra, Misfat Al-Abrein, Bahla and Jabal Akhdar (18 farmers interviewed); the 'Southern Batinah' area - Balad Seet, Wadi Mistal, Wadi Bani Kharus, Wadi Sahtain and Al-Awabi (24 farmers interviewed); the 'Sharqia' - Ibra and Wadi Dama Wa Taeen region (24 farmers interviewed); the 'Al-Qurait' area - Hubaina (3 farmers interviewed)

Those interviews were followed by the use of a formal questionnaire that covered details about the land cultivated with landraces, farming practices, land ownership and local names for the cultivated wheat germplasm (Appendix 2 [online]).

Results

The plot size cultivated to landraces by individual farmers in the typical oasis agriculture (Plates 2 and 3) was small, varying between 1 and 10 500 m² across the study zone. All wheat germplasm was sown broadcast as a sole crop, without chemical plant protection within the highly diverse mosaic of crops grown within the oases. Apparently rust diseases were the only agronomic problem hampering yields of landraces. The farmers interviewed during the survey stated that they preferred landraces to government-supported germplasm because of the tastiness of the grain, better adaptation of landraces to the land, lower susceptibility to rust and particularly because they also produced larger amounts of straw which could be fed to ruminants. All the farmers interviewed stated that they stored their grain at home on the head and would only thresh directly before its consumption by their family (Plate 4). Only a minor proportion of the grain was sold at

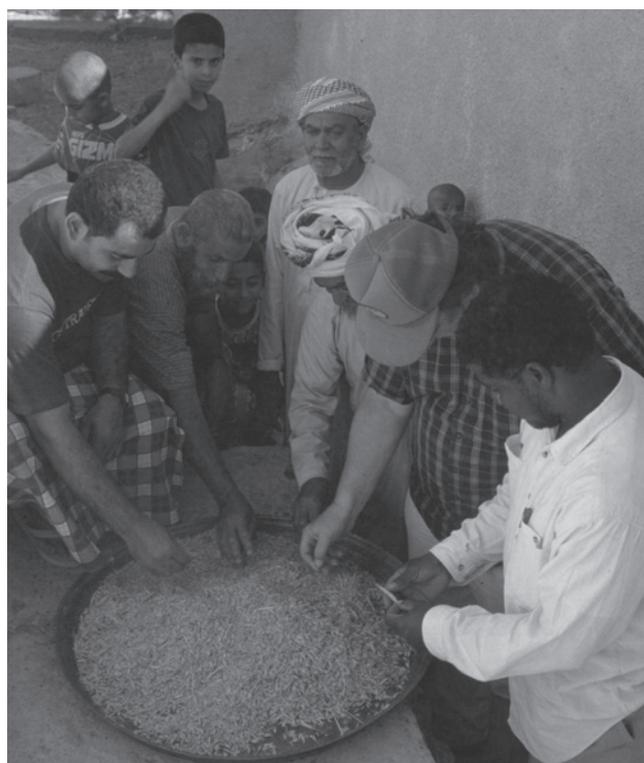


Plate 1. Researchers collecting seed in a small mountain village in Oman in March 2002.



Plate 2. Typical small-scale agricultural setting with small wheat fields in northern Oman.



Plate 3. Aerial photograph of a typical mountain oasis with date palms and wheat fields.



Plate 4. An Omani farmer manually threshing wheat.

harvest time to village visitors, or at the local market. A few times, ill-defined medicinal properties of landrace grain were mentioned as a major nutrition-related advantage of landrace grain over grain from 'modern' varieties. Seed exchange between farmers was reported to be frequent but at the same time, each farmer would do all he could to preserve the seed he had inherited from his father, or grandfather.

At the time of the survey, 28% of the interviewed farmers who stated that they cultivated landraces had no seed on hand; 32% had planted all their seed; 4% had stored seed at that time; and 36% had used some of their germplasm for (re)production, but maintained a safety stock at home (Table 1).

The variation between the four study regions with respect to the landraces used appeared to be relatively small and random (Tables 2 and 3). Among the eight landrace names mentioned by the farmers, 'Alas' (Table 3) was comprised of a mixture of *T. dicoccon* varieties, whereas the other landraces were composed of *T. aestivum* and *T. durum*. 'Alas' was preferred by farmers because of its reportedly higher tolerance to drought and a better taste when used for bread making, even if its preparation is more laborious. Regardless of whether the seed was planted or stored, the most common landraces in use by farmers were 'Walidi', with about 50%, followed by 'Missani', with about 20%, 'Sarraya' with 12% and 'Greda' with 5%.

Field observations also indicated that names for material with the same morphological characteristics could vary between regions. For example, the same landrace was named 'Gradi' in the interior and 'Walidi' in Sharquia. In addition, prior to this survey, the landrace names 'Humaira' and 'Mufsikha' have not been recorded.

The material collected during this survey is currently being sown under controlled conditions in a growth chamber and under field conditions in Germany; its morphological and molecular characterization will follow. Only this will allow us to examine the degree of consistency in the indigenous naming of the germplasm and the relatedness of the collected material to other wheats from the Middle East, India and East Africa. Certainly Omani wheat landraces will merit further research to better understand their origin, genetic structure and potential for future breeding programs.

Table 1. Numbers of interviewed Omani farmers who had no landrace seed, seed planted, seed stored or seed planted and stored in March 2002

| Area | Status of wheat landrace seed | | | | Total farmers interviewed |
|-------------------------|-------------------------------|-----------|----------|--------------------|---------------------------|
| | No seed | Planted | Stored | Planted and stored | |
| Interior | | | | | |
| Jabal Akhdar | 3 | 0 | 0 | 1 | 4 |
| Bahla | 1 | 0 | 0 | 3 | 4 |
| Misfat Al-Abrein | 0 | 2 | 0 | 1 | 3 |
| Al-Hamra | 3 | 3 | 1 | 0 | 7 |
| Southern Batinah | | | | | |
| Balad Seet | 1 | 0 | 0 | 4 | 5 |
| Wadi Mistal | 0 | 3 | 0 | 2 | 5 |
| Wadi Bani Kaharus | 0 | 6 | 0 | 0 | 6 |
| Wadi Sahtain | 2 | 0 | 0 | 2 | 4 |
| Al-Awabi | 1 | 1 | 0 | 2 | 4 |
| Sharquia | | | | | |
| Ibra | 4 | 2 | 1 | 3 | 10 |
| Wadi Dama Wa Taeen | 4 | 4 | 1 | 5 | 14 |
| Al-Quraiat | | | | | |
| Hubaina | 0 | 1 | 0 | 2 | 3 |
| Total | 19 | 22 | 3 | 25 | 69 |

Table 2. Frequencies of landraces planted by interviewed farmers (see Table 1)

| Area | Landraces | | | | | | |
|-------------------------|-----------|---------|-------|----------|----------|---------|--------|
| | Walidi | Missani | Greda | Mufsikha | Shwairaa | Sarraya | Hamira |
| Interior | | | | | | | |
| Jabal Akhdar | | | | | 1 | | |
| Bahla | 2 | 1 | 1 | | 1 | 1 | 1 |
| Misfat Al-Abrein | 1 | 2 | | | | 1 | |
| Al-Hamra | 2 | 1 | | | | | |
| Southern Batinah | | | | | | | |
| Balad Seet | 3 | 2 | 1 | | | 1 | |
| Wadi Mistal | 3 | 2 | | | | 2 | |
| Wadi Bani Kharus | 2 | 1 | 1 | | | | |
| Wadi Sahtain | | 1 | 1 | | 1 | | |
| Al-Awabi | 2 | 2 | | 1 | | | |
| Sharquia | | | | | | | |
| Ibra | 8 | 1 | | | | 2 | |
| Wadi Dama Wa Taeen | 13 | 1 | | | | 1 | |
| Al-Qurait | | | | | | | |
| Hubaina | 3 | 1 | | | | | |
| Total | 39 | 15 | 4 | 1 | 3 | 8 | 1 |

Table 3. Frequencies of landraces stored by interviewed farmers (see Table 1)

| Area | Landraces | | | | | | | |
|-------------------------|-----------|--------|---------|-------|----------|----------|---------|--------|
| | Alas | Walidi | Missani | Greda | Mufsikha | Shwairaa | Sarraya | Hamira |
| Interior | | | | | | | | |
| Jabal Akhdar | | | | | | 1 | | |
| Bahla | 1 | 1 | 1 | 1 | | 1 | 2 | 1 |
| Misfat Al-Abrein | 1 | 1 | 2 | | | | 1 | |
| Al-Hamra | | 2 | 1 | | | | | |
| Southern Batinah | | | | | | | | |
| Balad Seet | | 3 | 2 | 1 | | | 1 | |
| Wadi Mistal | | 1 | 2 | | | | 2 | |
| Wadi Bani Kharus | | 2 | 1 | 1 | | | | |
| Wadi Sahtain | | | 1 | 1 | | 1 | | |
| Al-Awabi | | 2 | 2 | | 1 | | | |
| Sharquia | | | | | | | | |
| Ibra | | 8 | 1 | | | | 2 | |
| Wadi Dama Wa Taeen | 2 | 13 | 1 | | | | 1 | |
| Al-Qurait | | | | | | | | |
| Hubaina | | 3 | 1 | | | | | |
| Total | 4 | 36 | 15 | 4 | 1 | 3 | 9 | 1 |

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Appendix 1. Landraces of other crops collected in the mountain oases and also in the Batinah region - available online: http://www.ipgri.cgiar.org/pgrnewsletter/default.asp?id_issue=141.

Appendix 2. Formal questionnaire covering details about the land cultivated with landraces, farming practices, land ownership and local names for the cultivated wheat germplasm - available online: http://www.ipgri.cgiar.org/pgrnewsletter/default.asp?id_issue=141.