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Further information on farro (*Triticum monococcum* L. and *T. dicoccon* Schrank) in South Italy[1]

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Summary

Four years of research in South Italy allow to present further information on botany, distribution, cultivation and utilization of the two farro (*T. monococcum* and *T. dicoccon*) found in the Daunia and Sannio mountains in 1980 and in the Napoletano and Lucano Appenines during missions conducted in 1981 and 1982. A detailed list of the material found and the corresponding collecting sites is given. The most frequent races are var. *vulgare* Koern. in *T. monococcum* and var. *dicoccon* and var. *rufum* Schuebl. in *T. dicoccon*.

Theoretical considerations on the genetics and evolution of the two *Triticum* species underline the importance of their "*in situ*" conservation and recall the attention of the most responsible authorities on their potentials as cultivated cereals.

Introduction

While it was thought that the two farro (*Triticum monococcum* L. and *T. dicoccon* Schrank) were not any more cultivated in Italy (PANTANELLI 1944, CIFERRI and BONVICINI 1959, ANGELINI 1965, VALLEGA 1977) some fields cultivated with these two wheats were at first found (PERRINO et al. 1981) in the territories of Castelfranco in Miscano (Benevento) and Monteleone di Puglia (Foggia). The results together with those of researches conducted in 1981 (PERRINO et al. 1982), 1982 (PERRINO and HAMMER 1983a) and 1983 (PERRINO et al. 1984) in other provinces of South Italy (see also PERRINO 1982, PERRINO and HAMMER 1982) will be mentioned and discussed here.

Methods and material

The results presented in the following paragraphs have been obtained through interviews with the farmers who provided samples of "farro medio" *(T. monococcum)* and "farro piccolo" *(T. dicoccon)*. Obviously the number of farmers interviewed and of fields and plots visited was much greater than that of the collected samples. The explored areas were

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those between the Adriatic and Tirrenic sea and between 40° and 42° of North latitude. The details concerning itineraries, techniques and strategies of collecting are reported in other papers (PERRINO et al. 1981, 1982 and 1984, PERRINO and HAMMER 1983a).

List of material and collecting sites

3. 9. 1980			
Montefalcone	No. 5802a	*T. dicoccon*, some spikelets in *T. aestivum*	altitude: 400 m
4 km n of Castelfranco	No. 5809	*T. dicoccon*	altitude: 800 m
4. 9. 1980			
3 km e of Castelfranco	No. 5815	*T. monococcum*	altitude: 680 m
	No. 5816b	*T. monococcum*, some spikelets in *H. vulgare*	
3 km s of Ginestra	No. 5818	*T. dicoccon*	altitude: 550 m
0,5 km s of Castelfranco	No. 5819	*T. dicoccon*	altitude: 760 m
	No. 5820	*T. dicoccon*	
4 km s–e of Castelfranco	No. 5821	*T. monococcum*	altitude: 590 m
between Monteleone di Puglia and Accadia	No. 5831a	*T. dicoccon*	altitude: 670 m
	No. 5831d	*T. monococcum*	
28. 8. 1981			
e of Teora near the street to S. Andrea	No. 7556a	*T. monococcum*	altitude: 720 m
29. 8. 1981			
2 km s–w of Rapone near the road to Pescopagano	No. 7589	*T. dicoccon*	altitude: 850 m
30. 8. 1981			
Corleto Monforte	No. 7614b	*T. dicoccon*, few spikelets in *T. durum*	altitude: 500 m
31. 8. 1981			
3 km e of Roccadàspide	No. 7619	few spikelets of *T. dicoccon* and *T. monococcum* in *Vicia faba*	altitude: 200 m
8. 9. 1982			
3 km s–e of Sicignano Scalo	No. 8618	*T. monococcum*, few spikelets in *Avena sativa*	altitude: 250 m
	No. 8619	*T. monococcum*, few spikelets in *Hordeum vulgare*	
9. 9. 1982			
3 km s–e of Brienza on the way to Marsico Nuovo	No. 8630	*T. dicoccon*	altitude: 720 m
2 km e of Brienza on the way to Marsico Nuovo	No. 8632	*T. dicoccon*	altitude: 700 m
2 km n of Satriano di Lucania	No. 8634	*T. dicoccon*	altitude: 720 m
6 km n–w of Tito	No. 8639	*T. dicoccon*	altitude: 1000 m
10. 9. 1982			
2 km before Picerno from Tito Scalo	No. 8643	*T. dicoccon*	altitude: 600 m
Montagna li Foj	No. 8649	*T. dicoccon*	altitude: 1000 m

11. 9. 1982			
Abriola	No. 8722	*T. dicoccon*	altitude: 700 m
12. 9. 1982			
Contrada Pozzi, 5 km s–e of Laurenzana	No. 8727	*T. dicoccon*	altitude: 1000 m
2 km s of Anzi, along the Basento	No. 8730	*T. dicoccon*	altitude: 550 m
13. 9. 1982			
Corleto Perticara	No. 8747	*T. dicoccon*	altitude: 800 m
14. 9. 1982			
2 km w of Viggiano			
e of Tramutola, Azienda	No. 8770	*T. dicoccon*	altitude: 800 m
sul Fondovalle	No. 8783	*T. dicoccon*	altitude: 600 m
Contrada Serra Carba	No. 8784	*T. dicoccon*	altitude: 850 m

Results

Distribution

The cultivation of the two farro in the explored area allowes the following conclusions. The two wheats are cultivated in a more or less discontinuous way along the Appeninic area (for a distribution map see PERRINO and HAMMER 1984). They have not been found in the low lands along the coast. Their altitude of cultivation is mainly comprised between 500 and 1000 m. Exceptionally, they occur as weeds in other crops in lower altitudes. As in Romania (PÉNTEK and SZABÓ 1981) *T. monococcum* has reached sometimes the status of a weed. The farro are cultivated on plateaus, basins, valleys and watersheds with more than 20 % of slope and any aspect towards rivers of primary and secondary importance.

The southern border of *T. dicoccon* cultivation seems to be the river Agri. Whereas north of the river farro could be found occasionally, in the montains south of the river there may be only very few fields. Some farmers remembered the cereal but we could not find any material. Following this direction to Calabria even the name is not known. Detailed studies in Sicily (PERRINO and HAMMER 1983b) did not give any evidence of farro cultivation, too.

An estimation concerning the amount of farmers cultivating the farro in Italy is given by PERRINO and HAMMER (1984).

Botanical classification

Triticum monococcum L.
var. *vulgare* Koern.

This is the predominant race (fig. 1). A few spikes of var. *macedonicum* Papag. could be found. Other races are very rare. DOROFEEV and KOROVINA (1979) reported var. *nigricultum* Flaksb. and var. *tauricum* Drosd. from Italy.

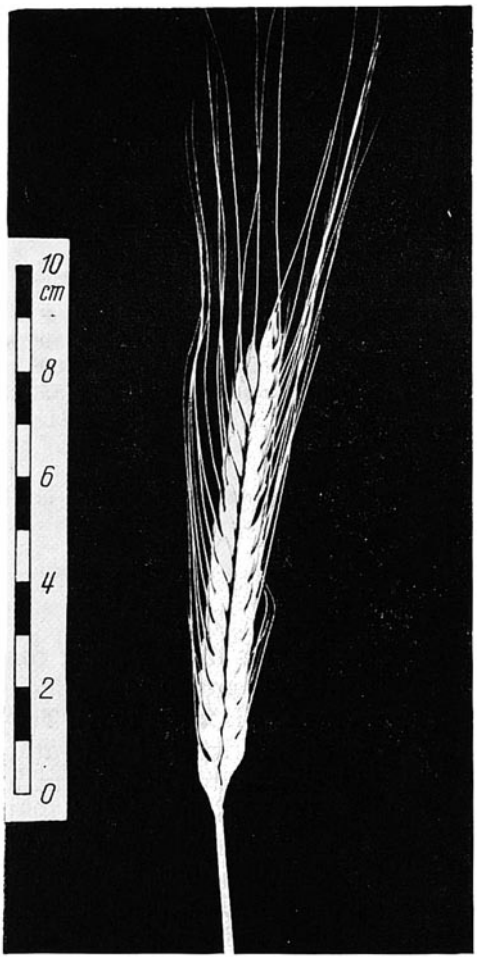

Fig. 1 Spike of *Triticum monococcum* collected near S. Andrea (Campania)

Triticum dicoccon Schrank
var. *dicoccon*

Most of the material collected belongs to this variety. There are great differences in spike size (fig. 2).

var. *rufum* Schuebl.

Occasionally among the predominantly yellow spikes. Further races may be found when studying the collected material in our reproduction fields.

Cultivation and utilization

The two wheats are sown by hand in autumn in rotation with fallow land, local maize or with other cereals like durum and bread wheats, barley and oats or with broad beans and other pulses on deep and not irrigated soils. Harvesting and threashing are fulfilled during June–July by hand, with animals or by using machines.

Fig. 2 The material of *T. dicoccon* shows great differences in spike size. Spike from a population collected near S. Andrea (Campania)—left, spike from a population collected near Castelfranco (Campania)—right. The differences between the populations exceed the infrapopulation variability by far

Cultivation techniques change according to the agricultural situations. Since farro is used exclusively for feeding animals and especially pigs, purity of seeds is often handled without care. Several farmers who do not grow farro any more have stated to have "lost" their seed because of heavy *Lolium temulentum* infestation. In our samples there was usually a great amount of other seed weeds, too, especially of *Agrostemma githago* with large seeds, which represents a progressive stage of co-domestication (HAMMER et al. 1982).

Extension of cultivation is variable. In most of the cases it does not overcome half a hectare, though in some big farms it may reach one hectare (see PERRINO and HAMMER 1984).

Usually the production of spikelets at ripening is considered to be "good", i.e. as much as that of other cereals, and in some cases even above that of barley. One farmer told that the production was twenty times the amount that was sown.

The two farro are considered to be resistent to smut and other diseases. Only one sample of *T. dicoccon* was found to be attacked by smut (*Tilletia caries*).

According to the most old farmers, who cultivate farro since a long time, the

two wheats were much more cultivated up to the second world war. The farmers who grow farro are also keeping pigs. Farro is believed to improve the fodder; the pigs would grow quicker and be more healthy. A character which would distinguish a pig fed also with farro, again according to the growers, is that of showing a more bright "hair" (coat). Another advantage would be that of being more digestible than barley.

In agricultural situations more vulnerable to the progress, probably more for human factors than for environmental ones, it seems that the cultivation of farro was suspended because of low yield.

Conservation "*in situ*"

Between the two farro still cultivated in Italy and those present in the collections of some Institutions around the world there are the following differences. The former have been conserved "*in situ*" and hence represent the result of a long and continuous selection by man but mainly by the environment (evolution under

Fig. 3 Other tetraploid wheats have contributed to the evolution of *T. dicoccon*, as can be seen from spikes collected near Montefalcone (Campania)

domestication); because these populations consist of millions of individuals one may exclude that genetic drift was as predominant as in small collecting populations. The populations contain many well balanced genotypes. Moreover, during cultivation they may have contributed to the evolution of other species of tetraploid and hexaploid cultivated wheats and vice versa (fig. 3) as well as of other wild Gramineae present in the area of cultivation. This factor alone would be a good reason to continue in cultivating the two farro or even to spread their cultivation to the most suitable environments.

Small populations of farro in collections, instead, have been preserved in the absence of natural evolution. They could have undergone a genetic drift leading to good fitness only for a limited number of environments and may be, very likely, different from the original ones.

It is easy to forsee that a study about the evolution of the two farro conserved "*in situ*" and on that of the same wheats preserved in world collections, could give results extremely interesting.

Considerations and conclusions

For more than a half century, the State, research Institutes, Seed Companies and other institutions have been competing for increasing the distribution and cultivation of varieties of wheat and other crops all over Italy but, nevertheless, the farro has not disappeared. This may be because of geographical, environmental, and social reasons and because it contains also particular features absent in other crops, i.e. competitive for the same environments or agricultural farm systems of the Appenine.

During our explorations several farms were seen, apparently with good rural buildings, but completely abondoned. In the last twenty years the reduction of the farro cultivation is more the consequence of an increase of abondoned lands mainly through emigration of people from farms to cities than to intrinsic negative features of the crop. These informations could be considered of some interest for those agronomists and other researchers responsible for the management of environments and production of the so called "marginal zones" (Bonciarelli 1980) who precisely in the light of these discoveries could consider the possibility of redistributing the farro into rainfed zones and especially to farms with a trend toward animal husbandry.

Thanks to the work of few and unknown farmers, a prehistoric crop, cultivated on a large scale in Italy even at the beginning of our century, has continued to cope with the climate of the peninsula and exists to be included into research programmes by agronomists, plant breeders, geneticists, evolutionists and botanists. In the belief that farro had disappeared from the Italian fields they utilized for their studies material mainly from other countries.

An adequate interdisciplinary intervention at the national level could prevent a further reduction of the cultivation of the two species.

Zusammenfassung

Weitere Informationen über Farro (*Triticum monococcum* L. und *T. dicoccon* Schrank) in Süditalien

Vierjährige Studien in Süditalien erlauben es, weitere Informationen über Botanik, Verbreitung, Kultur und Nutzung der beiden Farro-Weizen (*T. monococcum* und *T. dicoccon*) zu geben, die 1980 in den Daunia und Sannio Bergen und 1981 bzw. 1982 in den Napoletano und Lucano Apenninen auf Sammelreisen gefunden wurden. Eine ausführliche Liste des Materials und der entsprechenden Sammelorte wird gebracht. Die häufigsten Sippen sind var. *vulgare* Körn. bei *T. monococcum* bzw. var. *dicoccon* und var. *rufum* Schuebl. bei *T. dicoccon*.

Theoretische Schlußfolgerungen über Genetik und Evolution der beiden Weizenarten unterstreichen die Bedeutung ihrer Erhaltung *„in situ"* und lenken die Aufmerksamkeit verantwortlicher Einrichtungen auf ihre potentiellen Möglichkeiten als Kulturgetreide.

Краткое содержание

Новые сведения о «Фарро» (*Triticum monococcum* L. и *T. dicoccon* Schrank) из Южной Италии

Четырёхлетние исследования в Южной Италии позволяют дать новые сведения о ботанике, распространении, культуре и использовании обеих пшениц «Фарро» (*T. monococcum* и *T. dicoccon*), которые были найдены во время экспедиции 1980 г. в горах Дауниа и Саннио и в 1981–1982 гг. в Неаполитанских и Луканских Апеннинах. Приводится подробный список материала и местонахождений образцов. Наиболее часто встречающимися формами были: для *T. monococcum* — var. *vulgare* Körn. и для *T. dicoccon* — var. *dicoccon* и var. *rufum* Schuebl.

Теоретические выводы по генетике и эволюции обоих видов пшеницы подчёркивают значение их сохранения *in situ* и обращают внимание ответственных учреждений на их потенциальное значение как культурных хлебных злаков.

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