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Excerpt

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## On the Eastern centers of origin of cultivated plants

A GREAT INTEREST in the study of Asia Minor, the Middle East and China exists not only due to the natural desire for penetrating into the life of the ancient peoples, whose fates are inscribed in the early history of Man, not only because sooner or later the East will lead the same life as the West, but especially because the key to the understanding of many important contemporary natural-historical and cultural-historical phenomena is found just in the East.

The present plant and animal life in Europe, Siberia and Turkestan is intimately associated with the plants and animals of the East. To understand the evolution and the origin of the plants and the animals in our own country, it is impossible to avoid associating them with the plant and animal life in the mountain areas of southwestern and southeastern Asia.

This is especially obvious with respect to our important cultivated plants and domesticated animals. The ancestors of our domestic animals are the wild horses, the wild camels and the wild yaks discovered by Przheval'skiy in central Asia. In the mountain areas of Asia, travelers are struck by the amazing variety among the species of domesticated cattle. Nature has collected a living museum there of all kinds of existing breeds. This is also, to a great extent, manifest in the case of cultivated plants.

The objective of the present short article is first and foremost to sum up our knowledge about the relationship between the European cultivated plants and those of the East.

For a long time, historians, archaeologists, philologists, agronomists and botanists have been drawn to the problems concerning the origin of our cultivated plants.

The questions concerning the origin of a given cultivated plant – how it became cultivated, where its original native land was, where the sources of the development of varieties were found, and where the clues to the wealth of forms could be discovered – are not only of general importance for explaining the historical destiny of peoples but also of actual and practical importance for the present agronomical work toward the exploration of varieties for plant breeding.

During the decades following the classical works by De Candolle and Hehn,

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some interesting reviews have been published, e.g. Buschan: *Yorgeschichtliche Botanik* (1895); Laufer: *Sino-Iranica* (1919); Sturtevant: *Notes on edible plants* (1919); Carrier: *The beginnings of agriculture in America* (1923); A. Schulz: *Die Geschichte der kultivierten Getreide* (1913), and Gibault: *Histoire des legumes* (1912), and so on.

Until recently, the problem concerning the site of the origin of plants was decided mainly on the basis of archeological and linguistic work and, in part, on the basis of historical data and the localities of the appropriate, cultivated plants in their wild state. The antiquity of plants was determined mainly by means of archaeological discoveries. Dispersal of the plants from one country to another and from one people to another was decided on the basis of comparisons between the names of the plants in various languages.

Investigations during the last couple of years by the Department of Applied Botany and Plant Breeding of the State Institute for Experimental Agronomy have allowed the introduction of new, more exact methods for determining the centers where the development of different kinds of cultivated plants took place, i.e. methods for identifying the centers of origin according to the *concentration of the variation of types*. A detailed review of the investigations concerning cultivated plants is at present being prepared for publication by this author.

In order to establish the centers of origin of different genera and families of animals and plants, botanists and zoologists usually determine the geographical distribution of the species and the maximum concentration of specific diversity within different areas. Such methods, although more differentiated, have also been applied by us in respect to cultivated plants.

While basing our work on the description of the centers where the development of the variations of different *species of cultivated plants* took place and in the light of the present representatives of the Linnaean species in the form of collective units, we have had to concentrate on the variety of species, races and modifications, i.e. on the small subdivisions, constituting the Linnaean species. If, for instance, it is necessary to establish the center of origin and development of varieties of cultivated rye, the verdict reached allows us to find the geographical center of the *maximum type-formation of rye*.

Investigations during the last couple of years have shown that, in spite of an important industrialization of cultivated crops, in spite of repeated migrations and colonization by peoples, and in spite of the antiquity of agriculture, it is still possible to establish the areas of endemic varieties and species and the areas of the original, primary development of forms. It has been demonstrated that, in general, the answer to the problem concerning the center of origin can be arrived at by the same methods as the botanists and zoologists apply for wild species, but by more profound and differentiated ones including an inventory of such forms and varieties for which the botanists and zoologists have had little interest.

The geographical concentration within various regions can sometimes be secondary, and in order to determine exactly the *actual center, where the development of forms took place*, it is necessary to supplement the data on the varieties of the species studied with data on the geography and distribution of

the varieties of adjacent, genetically closely related species and to compare the areas of contiguous wild and cultivated species. Thus, for instance, in order to determine exactly the center for the development of forms of soft wheat (*Triticum vulgare*) it is necessary to simultaneously clear up the center of variation of the closely related species of shot and club wheats (*T. compactum*, *T. sphaerococcum*).

The method of differentiating detailed phyto-geographical analyses of plants furnishes results immeasurably more exact than the methods used by archeologists and linguists who do not always distinguish between the species of plants, which are already botanically differentiated. Philologists, archeologists and historians speak of 'wheat', 'oats' and 'barley'. The present state of botanical knowledge demands that the cultivated wheat species be distinguished into 13 species, and oats into six species, all quite different and not able to cross with each other, and geographically originating from different centers, and so on.

It is natural that this kind of investigation requires an enormous number of specimens of all kinds of cultivated species from different countries and areas for a strictly systematic geographical study. The species must be studied not only in herbaria but also by cultivating them in order to be able to evaluate all the morphological and physiological as well as hereditary differences. Due to the inadequacy of the investigations of the many interesting areas of ancient agriculture in Asia and Africa, our information is so far fragmentary and often insufficient, and many countries are in need of special studies. However, since this method of actually establishing the centers of origin and development of forms on the basis of botanical data furnishes an absolutely exact answer to where the origin of a given plant is located, it can be utilized for practical breeding work and for searching out practical and valuable modifications from the primary source of type-formation of the plants in question.

De Candolle placed the native land of wheat in Mesopotamia. Investigations, applying the differentiating botanical methods used by me and my co-workers in the course of the last couple of years and based on a large amount of material collected by the Department of Applied Botany during special expeditions to Persia, Bokhara, Turkestan and Mongolia, as well as being provided with, thanks to the U.S. Department of Agriculture, an extensive collection of material from the rich collections in Washington assembled from various countries in Asia and Africa, have resulted in some unexpected results: it could be concluded that cultivated wheat has *two* basic centers. For one group of wheat species, in particular the hard ones such as our brands 'Byeloturka' and 'Kubanka', the original center of variation is found in *northern Africa*. For the most important group, i.e. that of soft wheat – the kinds that appear in the form of the common European wheats – a center of variation could be identified in *southwestern Asia*. It turned out that the more we approached southwestern Asia and the areas of Bokhara and Afghanistan, the greater was the variation in the species. The different modifications of the soft wheat increased as well. At the same time as the granaries of Russia, especially in the southeast and in the Samaran and Saratovan provinces, display six or seven varieties of soft wheat, the number thereof in Persia, Bokhara and Afghanistan amounts to 60. The

maximum variability, including all the varieties so far known, the majority of which are not cultivated in Europe, is found in the area between northern India and western Persia. There, in particular, a rich variation is found in the mountain areas of Bokhara bordering on Afghanistan as well as in Afghanistan itself. The Persian and the Mesopotamian areas, distinguished by a large number of species, all yield in this respect to Afghanistan and the mountain areas of Bokhara, where an exceptional wealth is found not only of soft wheat types but also of varieties of shot wheat (*T. compactum*), genetically close to the former. These are at present lacking in Persia. In addition, varieties of wheat are found there which are presently unknown in other countries (e.g. some with extremely simplified leaves – *eligulatum*). All characteristics of the cultivated kinds of soft wheat in Siberia, European Russia and western Europe are met with in southwestern Asia, although in different combinations. In Africa, soft wheat has been grown only recently by European colonizers. The New World has cultivated wheat as well as the majority of other agricultural plants (rye, barley, oats, millet, flax and peas) only since being occupied by the Europeans during the nineteenth century.

In the mountain areas of southwestern Asia there were discovered not only endemic varieties unknown to Europeans but also many typically European forms with easily-shed seeds. In Shugnan and Roshan, in the mountains of Bokhara, it was possible to observe typically East-Siberian small-grained kinds of wheat, indicating that the native land of the Siberian varieties of wheat is located in the mountain areas of southwestern Asia. Expeditions during 1922 for studying plants cultivated in Mongolia and led by a specialist from the Department of Applied Botany, i.e. V.E. Pisarev, confirmed definitely that all the wheats of eastern Siberia originate from the mountains to the south and were introduced into Siberia via Mongolia.

A great variation within the soft wheat types characterizes Georgia, Armenia and all of Transcaucasia. This is similar in composition to that in Persia. The center of development of one third of the types genetically close to the soft wheats, but belonging to the club wheat (*T. sphaerococcum*) was, as could be expected, found also in areas contiguous with Afghanistan and Bokhara, i.e. in northern India.

In the illustration showing the geographical distribution of the wheat varieties (see Fig. 1, p. 37) there are various symbols corresponding to different groups of variation, embracing a large number of species. The areas of the closely related varieties of soft wheat are indicated by different outlines. The illustration shows that all the groups center around a region in southwestern Asia where the maximum variation of the species and the corresponding center of origin of the soft wheat are found (for more details, cf. Vavilov, 1922).

Thanks to the geographical studies of wheats, a new aspect has opened up on Persian wheat (*T. persicum* Vav.) and on the great variety of its forms recently observed (in 1922) in Georgia and Armenia by the director of the Tiflis Botanical Garden, P.M. Zhukovskiy. Because of its physiological and morphological traits, this species forms a link between the African and the Asiatic groups of the wheat species.

These investigations are of great practical importance since they establish where it is necessary to search for initial material for breeding, and since they definitely determine that the European and Asiatic groups of cultivated wheats originated from southwestern Asia. During very ancient times, Egypt and countries in northern Africa had developed their own groups of cultivated wheat, sharply isolated from Asiatic wheats.

Investigations using the method of differential evaluation for the varieties and races of *cultivated barley* in the Old World have established that – just as in the case of the wheats – we can define *two basic centers* for its development of forms. On the one hand, it is *southeastern Asia*, including China, Japan and Tibet; on the other hand, an independent center of barley cultivation turned out to exist in the *northeastern part of Africa*, in the mountain areas of Abyssinia.

The asiatic Sino-Japanese center gave rise first to all the naked-grained, awnless and semi-awned barleys. Among these we encounter a multitude of peculiar forms, widely distributed in northern India and, in part, as early-ripening forms, reaching as far as the Altai and western Himalayas. The Abyssinian center gave rise initially to the European hulled barleys. The special expedition led by Dr. Harlan to Abyssinia has just returned. It was sent out by the U.S. Department of Agriculture to study cereal grasses and confirmed that this interesting country has indeed, in recent times, enriched our information about cultivated plants in an important way.

It has been definitely established that the native land of *millet* – both the common one (*Panicum miliaceum*) and the foxtail (*P. italicum*) – is found in eastern Asia, in China and in the countries contiguous with it. All the variable forms of millet, known in European Russia and in western Europe, originally came from eastern Asia, where, in addition, an enormous number of endemic, original kinds of millet, unknown in Europe, are found. In Mongolia, a millet exists that is characterized by its easily shed seeds, reminding us of wild grasses. Side by side with early-ripening mountain species, China, Manchuria and the Far East cultivate a large number of very late-ripening ones, unknown in Europe, e.g. groups of strongly and loosely spreading kinds with peculiar seeds. In some parts of Afghanistan and Bokhara, they cultivate curious (from a practical point of view) kinds of millet with thin membranes and easily shed hulls – analogous to the naked-seed barley. It is impossible to avoid mentioning that southeastern Asia (China) appears to be the native land also of large-grained, naked-seeded oats.

In the case of flax [*Linum*], the existence of *two independent centers* could also be established: one in *southwestern Asia*, the other in *northern Africa*. To the first one belong the common European forms of long-staple flax [*L. usitatissimum*], and a variety, distinguished by small seeds, small capsules and small flowers. To the second group belong large-seeded, large-capsuled and large-flowered races, typical of Egypt, Tunisia, Algeria, Morocco and the European coast of the Mediterranean but almost unknown among the groups grown in Russia.

Investigations have revealed that the species with such a distribution and such numbers of independent centers were also characteristic of flax in the remote past. The African flax species are characterized by large capsules and seeds (up to

6mm long) and are distinguished from the Asiatic types with small seeds (ca. 3 mm long). Archeological discoveries in Egypt from the time of the different dynasties of pharaohs revealed only large-seeded and large-capsuled types.

As far as it has been possible to demonstrate, all the varieties of flax in Asia are concentrated in Bokhara, India and Afghanistan where, in addition to the common types of flax, we also meet with white-seeded ones with wrinkled petals and extraordinarily late-ripening, low-growing and productive flax plants at the same or an even higher elevation, all common mainly in the high mountains.

Studies of Asiatic and European flax species revealed interesting facts about the regular distribution of the types in the Old World and explained the concentration toward the north of flax, cultivated mainly for its fibers, as opposed to the southern types, cultivated for their oily seeds. It turned out that the distribution from the centers of variation in the direction from the south toward the north occurred by virtue of natural selection with respect to the vegetative period. The length of the stem is, as a rule, closely associated with the vegetative period: the shorter the growing period, the earlier the species ripens and the longer the stem of the plant becomes and vice versa. Our northern fiber flax turned out to be the earliest-ripening type; in contrast, the southern linseeds, cultivated for oil and seeds, are all late-ripening and do not thrive in the north. In the mountain areas of Asia, where the maximum variation of both linseed and fiber flax is found simultaneously, the fiber flax tended to become more alpine, while the concentration of late-flowering native large-seeded kinds producing oil increased in a southerly direction. The cultivation of fibers moved naturally northward into central Russia and western Europe. On the other hand, in India, a concentration of linseed crops appeared, cultivated exclusively for seeds. Just as in the case of the cereal grasses, the mountain areas of southwestern Asia are the center of variation of flax species.

During the studies concerning the origin of *rye* we encountered a group of curious phenomena which subsequently turned out to be of general importance.

The rye cultivated in Europe, European Russia and Siberia is botanically entirely homogenous and represents, in essence, a single botanical variety (*Secale cereale* var. *vulgare*), marked in Fig. 6 by a 'V' (see p. 80).

The study of specimens from different areas showed that all the variation and wealth of rye forms were concentrated into those areas where rye was either of secondary importance or had never been important as a cultivated plant.

The main botanical variation of rye was found in *Persia*, *Afghanistan*, *Turkestan*, *Bokhara*, and in *Georgia* and *Armenia* (Transcaucasia), where rye is not cultivated but is known mainly as a weed contaminating wheat and barley and, especially, the crops of winter wheat and winter barley.

Among the *wedy* types of rye it was possible to establish an exceptional variety of types that had no representatives in Europe. In those areas, red-spiked rye, rye with long and coarse awns and rye with velvety hulls are very frequent. In the mountains of Bokhara are found types of rye with reduced leaves and without any ligulae. Recently, a black-spiked rye has been found in Georgia.

In short, in southwestern Asia, as well as in Transcaucasia, the investigator



comes in contact with an exceptional variety of rye, which reminds him of some types of soft wheat, and, in addition, the rye he finds there is mainly in the form of weeds among wheat and barley crops.

We must, without question, acknowledge that the main center for the variation and development of forms of *rye crops* occurs in southwestern Asia, i.e. within the same area where the development of some types of wheat took place.

The areas in which soft wheat and rye both developed coincide in striking detail. Thus, for instance, non-ligulate rye is found within the same area where non-ligulate wheat occurs, especially in northern Afghanistan. Rye with non-shedding, enclosed grains that is distributed in Turkestan and Persia is located also within the same areas where non-shedding soft wheat is found.

Local studies in Turkestan, Persia, Afghanistan and Bokhara reveal that rye is mainly a weedy plant. Rye is not cultivated in India, China, Syria or Palestine. It was not known in Turkestan until it was introduced by the Russians.

Moreover, the very epithets of rye used by different peoples in Turkestan, Persia, Afghanistan, Arabia and Turkey, i.e. 'gandum-der', 'dzhoy-der' and 'chou-der', mean literally 'plants preying upon or contaminating wheat or barley'. The names of rye in the languages of the inhabitants of these countries, thus, bear witness to the interference of this plant with the wheat and barley crops in a remote past. The wide distribution of these epithets all over the East, from India to Arabia, shows that the local inhabitants from time immemorial knew rye as a weed that was hard to get rid of.

Grains of wheat are hard to distinguish from those of rye even by the best of specialists. Therefore, complaints about rye, heard by travelers in Bokhara, Persia and Turkestan, can be understood.

However, rye does not always occur exclusively as a weed in southwestern Asia. As one ascends into the alpine areas of Turkestan, rye can be found which has become a commonly cultivated plant.

Rye is a crop plant in habitats high up in the mountains of Shugnan and Roshan, in Bokhara and in southern Fergana. Its epithets are already very different: the peoples in the valleys still use the names 'gandum-der' and 'chou-der', i.e. 'weeds', while the Tadjiks of Pamir call the rye 'kal'p' or 'loshak'.

Due to its very nature and its difference from wheat and barley, rye appears to be a biologically more frost-resistant, rougher and hardier plant. Therefore, it is natural that, in the course of cultivation of the former, the rye began, under more difficult conditions, to entirely replace the more tender wheat and barley plants. Rye tolerates lower temperatures and poorer soils than does wheat. It can be grown on low-yield, clayey or sandy soils where wheat either does not thrive or fares poorly.

Natural processes such as those that have taken place in the mountains have also occurred in the past during the dispersal toward the north. During the dispersal of crops of wheat from the center toward the south and north, east and west, the rye contaminating the wheat gradually displaced it and developed into crops of pure rye.

Involuntarily, Man made a weed into a crop during the northward dispersal of his crops. On poor soils and under severe conditions in the north, rye had, in

the words of the Taceers, become a 'better gift from the Gods' and the people began, by necessity, to sow rye instead of wheat. Similarly, at present, the farmers in northern and central Russia, also by necessity, plant rye rather than winter wheat.

Considering the above facts, the history of the origin of cultivated rye is extremely simple and easy to understand. The ancient crops of wheat and barley brought with them the rye in the form of a weed during the dispersal of the crops into more severe conditions with colder winters and with poorer soils; rye began to out-compete the more tender wheat and barley crops. In Mongolia, the contamination of the spring wheat with weedy rye still occurs, and there is a progressive increase in rye in crops the farther north one goes (V.E. Pisarev).

It is interesting that, at the boundary of competition between winter wheat and winter rye, farmers have for a long time, and do even now, purposefully sown a mixture of rye and wheat, called 'surzhy' or 'surzhik' [the 'hardy one']. While not relying on obtaining a good yield of wheat every year, the farmer knowingly sows a mixture of rye and wheat in the hope that, should the wheat crop fail due to a harsh winter, at least the rye will survive and give a reasonable yield. Such 'surzhy' can still be seen used in the Terian region, in the Balkans and in Normandy (Vavilov, 1917).

It may be possible to trace, in detail, all the processes of the introduction of rye into cultivation from southwestern Asia and from Transcaucasia. From the Caucasian mountain chain, rye spreads southward as a weed but northward as a cultivated plant.

In order to understand the origin of cultivated rye, it is thus necessary to associate it with the cultivation of wheat. Cultivation of rye was a result of the cultivation of wheat and, in part, of barley. It is therefore self-evident that the distribution areas of the varieties of soft wheat and rye coincide.

In practice, it turns out that the greatest interest for plant breeders must be concentrated to the fields of weedy rye [*Secale cereale*] in southwestern Asia. For the selection of new types, the weeds among the crops of wheat and winter barley in Persia, Afghanistan, Georgia and Armenia hold the greatest hope. From the weedy types of rye, special drought resistant races can be selected that deserve to be introduced into cultivation in southeastern European Russia and in the Ukraine (Vavilov, 1922).

On the whole, in accordance with the origin of rye from weeds among the wheat and barley crops, the fact is that, as far as data obtained from linguists and archeologists are concerned, cultivation of rye arose much later than that of wheat or barley, since it has long been known that the cultivation of rye originated from weeds among the former crops. We have barely enough data for an exact identification of the local origin of cultivated rye, but, evidently, this process occurred simultaneously and independently in different localities.

An analogous picture develops when investigating the cultivation of *oats*.

While traveling in Persia in 1916, we happened to come upon crops of emmer [macaroni wheat] with weedy oats. The emmer itself (a particular species of ancient wheat, *Triticum dicoccum*, with grains closely surrounded by its hulls) was met with in fairly small quantities, mainly in western Persia among the



Armenian settlements. As a rule, the crops of emmer were badly contaminated with such types of oats as are now cultivated. Emmer without oats was, on the whole, not seen in Persia. Neither Persians nor Afghans knew how to grow oats; in Turkestan the cultivation of oats was introduced by Russian settlers.

Studies of oats collected from the emmer fields revealed that they belong in part to an original, new kind of oat cultivated in Europe, i.e. *Avena sativa*. This weedy type is distinguished by the shape of its panicle, the structure of its hulls and represents, in general, its own kind of cultivated oat, easily crossing with the common types of cultivated oats. It has now been distinguished as a special variety.

This fact attracted our attention and forced us to investigate the weedy plants in emmer fields in other areas. As a result, we could establish that wherever emmer was grown, it was, as a rule, accompanied by the weedy oats; cultivated oat, thus, is represented by a specialized weed among emmer. Studies of the main Russian center of emmer cultivation in the Pri-Kama region (in the Kazakh, Siberian, Permian and Vyatsk provinces) revealed the presence of a large number of new forms of oats among emmer crops, which, until then, were not known in cultivation. It turned out that forms of oats were found that represented their own extreme morphological evolution as far as the attachment of grains in the spikelets is concerned, reminiscent of this structure in emmer itself. The different flowers adhere tightly and the grain itself can only with difficulty be dislodged from the glumes. When threshed, the spikelets remain whole.

Studies of the emmer in Georgia and Armenia resulted in discoveries of a number of different kinds of oats, unknown among the ordinary oat crops in Europe. In other words, it was evident that the center for selection of oats must be retraced to new kinds of oat varieties among crops of emmer, where the majority of the forms not found in pure cultures could be discovered.

Oats occur as bad weeds among emmer, lowering the quality of the meal and the flour. A very frequent phenomenon, particularly in the north, is the repression of emmer due to wild oats. In literature from the eighteenth and nineteenth centuries, we find many indications of displacement of emmer by wild oats. Thus, for example, an observer over a period of 40 years writes: 'Who among us does not know that oats overpower emmer so that from an imperceptible number of grains of oats, by chance found among the grains of emmer, after a few or up to some ten harvests thereof, the field seems to be sown with a crop of oats into which, by chance, some emmer is mixed' (Velikov, 1810). The ancient authors knew oats only as a weed among the crops of other cereals. Hehn explains the German epithet of oats, 'Hafer', as 'Bocksraut', i.e. a 'devilish weed'.

Thus, the interesting fact is that crops of emmer which, as far as can be established, have their center of origin in northern Africa, areas of Abyssinia, Asia Minor and Transcaucasia, when dispersed toward the north brought with them oats, in the form of an inescapable attribute, which during the northward transfer of the crops displaced the emmer.

Oats appear to be hardier plants, more resistant to cold and less demanding on

the soil. As definitely demonstrated through archeological discoveries, emmer represents a more ancient crop, which is presently to a major extent extinct. In all the world only a few centers remain for the cultivation of emmer in mountain areas (e.g. in Abyssinia, the Pyrenees, the Balkans and in the Caucasus) as well as in the Pri-Kama region among the Chuvaks, the Mordovinians and the Tatars. The cultivation of emmer occurs in small fields in isolated areas and among backward people, such as the Basques, the Chuvaks, the Mordovinians, the Ossetians, the Armenians and the tribes populating Abyssinia, who have preserved the ancient crops up to the present.

When dispersed over the Old World in the very remote past, emmer brought with it a collection of weedy plants; during the transfer of the crops toward the north, these weeds turned into separate crops. Thus, the cultivation of oats arose in a number of areas. In Transcaucasia and in other areas, wheat and barley are often contaminated by oats and the emanation of oats from the weedy crops of those cereals is very likely. For instance, in the province of Bratsk, many local crops remind one strikingly of speltoid forms of wheat. All information clearly indicates that oats are a more recent type of crop. The earliest information about cultivated rye and oats dates from the beginning of the Christian era. The comparative youth of oats as a crop becomes easy to understand, once we realize that this plant was brought along with other ancient crops (of emmer, wheat and barley), when they were dispersed from the south toward the north. There are many indisputable data in favor of the fact that the cultivation of oats arose from weeds: the ancestral origin of cultivated oats appears, consequently, to be the weedy oats, which until relatively recently contaminated emmer, wheat and barley.

Thus, in order to understand the evolution of the two very important northern crops, oats and rye, it is necessary to associate it with the development of cultivated emmer, wheat and barley.

We still don't have enough facts to confirm that all cultivated oats had this kind of an origin. Oats have a polyphyletic origin and, perhaps, different kinds of it (e.g. the African forms) became cultivated along other routes, which demand further research.

A comparison of facts reveals that such a kind of origin of other cultivated plants from weeds, contaminating old, basically southern crops, has happened fairly widely. No doubt, whole groups of the oil-producing cruciferous plants arose from weeds, contaminating other basic, but older crops. Garden Rocket (*Eruca sativa*), false flax (*Camelina sativa*), corn spurrey [*Spergula arvensis*] and sea rocket [*Cakile maritima*] all originated from weeds contaminating the basic crops of flax. Excellent research within this field has been done by N. V. Tsinger (1909).

Perhaps the vetches [*Vicia*], vetchlings [*Lathyrus*] and ordinary peas [*Pisum*] have also originated from some wild leguminose plants.

Tatarian buckwheat [*Fagopyrum tataricum*] is a serious weed among the crops of common buckwheat [*F. esculentum*] although it is at the same time a cultivated plant in some localities in the Altai.

In Crimea, einkorn [*Triticum monococcum*] contaminates the fields of emmer