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# BOTANICAL STUDIES I. THE GRECO-ISLAMIC TRADITION.

i. The Greco-Islamic Tradition

In the Islamic period, generally speaking, botany was an ancillary branch of medicine or, more precisely, pharmacology. Interest in studying the medicinal virtues of plants developed in the eastern countries of the Islamic world and only after the basic works of some ancient Greek physicians, principally Hippocrates (460?-377? b.c.), Galen (a.d. 2nd cent.), and the Greek physician-botanist Dioscorides (a.d. 1st cent.), were translated (directly or via Syriac) into Arabic in the 3rd/9th century at the Bayt al-Ḥekma (House of wisdom/philosophy) founded in Baghdad in 215/830 by the ʿAbbasid caliph al-Maʾmūn and patronized by his successors, especially al-Motawakkel (232-47/847-61). While Hippocratic and Galenic medical theory and practice were readily adopted by the physicians of the Islamic era—a system that has persisted down to our time in traditional and folk medicine throughout the Near and Middle East, it was the *Ketāb al-ḥašāʾeš* (Book of the herbs), a translation of Dioscorides' famed treatise on materia medica by Eṣṭefan b. Basīl and his master the celebrated physician-translator Ḥonayn b. Esḥāq (b. 192/808 at Ḥīra), that constituted the original source of knowledge and inspiration for medical and pharmacological writers (Arabs, Jews, Persians, etc.) in the lands of Islam in the Middle Ages and afterwards. Dioscorides described approximately 600 plants, mainly of the Mediterranean area, providing for every item equivalent names in some other languages, its

provenience, a short morphological description, and then a statement of its medicinal properties and uses.

Dioscorides was held in great esteem by all the physicians and scholars in the Islamic period, and the following statement by the great Iranian polymath Abū Rayḥān Bīrūnī of Ḵʷārazm (362-440/973-1048) in his *Ketāb al-ṣaydana* (introd., Ar. text, pp. 10-11) reflects the admiration for the scientific work of ancient Greeks in general and for Dioscorides in particular: "Every nation is distinguished by precedence in a certain science or practical art. The Greeks before Christianity were known for their eminent interest in research, for promoting sciences to their highest level, and for bringing them to near perfection. Had their Dīsqūrīdes been in our regions [i.e., Iran, Central Asia], he would have devoted his effort to exploring what there is in our mountains and semideserts, the weeds/herbs of these would all have certainly become medicines, and what is collected from there would have turned out to possess curative virtues according to his experiments. But the West succeeded in producing him and people like him, and benefited us with their meritorious endeavors scientifically and practically. As to the East, except for India, there is no nation keen on any science (*yahtazzo le ʿelm*)."

Though Bīrūnī's philhellenic appreciation might be generally true with regard to pharmacology and medicinal botany in Islamic lands, progress in these disciplines was bound to develop due to the almost unlimited medicinal potential of the vegetable kingdom. Indeed, Bīrūnī himself did not totally exclude that development (op. cit., p. 9): "The art which is superior [to the mere knowledge of simple drugs] is the knowledge of the *qowā* (Galenic "forces") of these and their properties. If there was any limit to what was gained by long experience and by applying *qīās* (analogical reasoning) to it, Dīsqūrīdes certainly was worthiest to circumscribe it and Jālīnūs (Galen) most entitled to limit it; and among the moderns Yaḥyā b. Māsawayh, Māsarjowayh, Moḥammad b. Zakarīyāʾ [Rāzī], and Abū Zayd Arrajānī could do it, albeit the latter were compilers/collectors (*jammāʿūn*) and incapable of the assiduous deep study (*ejtehād*) by those [Greek] pioneers (*awāʾel*)."

The expected development of knowledge about plants and botanical drugs is already visible in the *Ferdaws al-ḥekma*, the oldest known medical compendium (*konnāš*) in the Islamic period, composed in Arabic in 236/850 for al-Motawakkel by ʿAlī b. Sahl Rabban Ṭabarī, a physician of Iranian stock but of Christian background. In his sketchy inventory of the Galenic *qowā* of simples, nutriments, and the like he mentions about twenty new plants or

substances of vegetable origin unknown to the Greek masters under their Persian, persianized, and Arabic or arabicized names, e.g., *āmalaj* (emblic), *ambarbārīs* (barberry), *halīlaj* (chebule), *jadvār* (zedoary), *jaz-angobīn* (manna from *Tamarix mannifera*), *jowz(-e) būyā* (nutmeg), *kāfūr* (camphor), *ṣandal* (sandalwood), *sabestān* (sebesten), *sokkar* (cane sugar), *ṭabāšīr* (bamboo sugar), *ṭaranjobīn* (manna from *Hedysarum alhagi*), *zanjabīl* (ginger). (For a partial list of the simples introduced into Galenic pharmacopoeia by the scholars of the Islamic period, see Leclerc, II, pp. 232-33).

Ṭabarī mentions as his sources Ḥonayn b. Esḥāq and the Persian Christian Yūḥannā b. Māsūya in addition to Hippocrates, Aristotle, Dioscorides and Galen. Yūḥannā (d. 243/857), one of the "moderns" underrated by Bīrūnī, was one of the teachers of Ḥonayn and, according to M. Levey (p. 160), the last great physician of the famous old Jondīšāpūr medical school founded by Ḵosrow I (Anōšīravān; r. 531-79), with the scientific tradition of which were also associated such early physicians of the Islamic era as the Persian Jew Māsarjūya/Māsarjowayh (fl. late 2nd-early 3rd/8th-9th cents.), and the Christian ʿĪsā b. Māsa (d. 275/888). The pharmacological works of Ebn Māsūya, Māsarjūya, Ebn Māsa, and later Arrajānī (who served the Buyid ʿAżod-al-Dawla, r. 338-72/949-82) being lost, we cannot evaluate their originality in medicinal botany, but the quotations from them by later authors bear witness to the importance of their contributions (one may compare, e.g., the statements of the first three about rice with those of Dioscorides and Galen as quoted by Ebn al-Bayṭār, pt. 1, pp. 18-19, s.v. *aroz*(*z*)). However, Yūḥanna's short treatise on simple aromatics (see the bibliography), probably the oldest work of its kind in the Islamic world, has survived. Most of the twenty-nine items dealt with are of vegetable origin, e.g., *hāl bawwā/būyā* (cardamon), *harnava/harnowa* (agalloch fruit), *qaranfol* (cloves), *qerfa* (cinnamon), *sonbol* (Indian spikenard), and *zaʿfarān* (saffron). Some of these aromatics, e.g., the *hāl būyā* and the *harnava*, were new additions to the Greco-Islamic stock.

Rāzī (250-313/864-925), another of the "moderns" whose medicinal botany was disparaged by Bīrūnī, was the first great Iranian Muslim scientist to handle the already tremendous pharmacological corpus and terminology inherited from his Western and Eastern predecessors. His therapeutic encyclopedia (*Ketāb al-ḥāwī fi'l-ṭebb*, his medical compendium *Ketāb al-manṣūrī*, his short treatise *Ketāb manāfeʿ al-aḡḏīa wa dafʿ mażārrehā* (on the advantages of food

and the defense against its harmful effects), etc., are a repository of botanical--pharmacological knowledge which he passed on to posterity first in the East and then (through Latin translations) to the West. About 630 medicinal plants and botanical drugs are mentioned in the 20th and 21st parts of the *Ketāb aṭ-ḥāwī* (Solṭānī, p. 241), but a thorough scrutiny of all his medical works would certainly reveal a greater number. His materia medica is cited only twelve times by Abū Manṣūr Heravī (see below), but 400 times by Ebn al-Bayṭār, the highest number of quotations after those from Dioscorides and Galen (Levey, pp. 106, 116).

Next to Rāzī is ʿAlī b. ʿAbbās Majūsī Arrajānī better known to the medieval West as Haly Abbas, a Persian physician with a Zoroastrian background (hence his nickname al-Majūsī "the Magian"). At the beginning of his great medical encyclopedia, *Kāmel al-ṣenāʿat al-ṭebbīya* (I, p. 2), he is introduced as the pupil of Abū Māher Mūsā b. Yūsof b. Sayyār al-Majūsī, and in the colophon (p. 434) he is said to be known as physician to ʿAżod-al-Dawla. To justify this work, despite the availability of the works of Hippocrates, Galen, Oribasius, Paulus Aegineta, and of the "moderns" (*moḥdaṯūn*) Ahrūn, Yūḥanna b. Sarābīūn, Masīḥ b. Ḥakam, and Rāzī, he points out the defects or inadequacies in their works (pp. 3-5). As far as pharmacology is concerned, the drawback which he found in the works of the Greek masters and their Islamic imitators was that many simple drugs mentioned by them were not known or found in the eastern countries of Islam. He then describes his own therapeutic innovation as follows (p. 6); "As to drugs, I have mentioned only what is used by the physicians in the Fourth Clime, ʿErāq and Fārs, and what has been sanctioned by their experimentatioṇ . . . since a lot of the drugs used by ancient Greeks were discarded by the people of ʿErāq and Fārs . . ." Notwithstanding this purposeful elimination Majūsī mentions about 335 plants and substances of plant origin, adding a short description of their Galenic "forces" (I, pp. 183-91, II, pp. 100-29). However, the great merit of Majūsī in this regard is to have introduced a kind of practical, albeit unsophisticated, classification in the presentation of the vegetable materia medica. This he grouped as follows: 1. vegetables (*boqūl*), e.g., *bāḏaranbūya* (*Melissa officinalis* L.), *bāḏarūj* (*Ocimum* sp.?), *esfānāḵ* (spinach); 2. weeds, grasses (*ḥašāʾeš*), e.g., *bāḏāvard* (*Volutarella divaricata* Benth.), *barenjāsef* (*Artemisia vulgaris* L.), *baršāwošān* (maidenhair), *jāwašīr* ([resin of] *Opopanax chironium* Koch.), *šāhtarj* (fumitory); 3. plants used for their seeds (*bozūr*), e.g., *anjora* (nettle), *fanjankošt* (*Vitex agnus castus* L.), *nānaḵᵛāh* (*Carum*

*copticum* Benth.), *šūnīz* (nigella); 4. plants used for their grains (*ḥobūb*), e.g., *dawṯar/dūṯar* (*Triticum ovatum* L.), *kākanj* (ground cherry), *māš* (mungo bean); 5. vegetables used for their fruits (*ṯemār*), e.g., *bāḏenjān* (eggplant), *beṭṭīḵhendī* (watermelon), *kankar* (*bostānī*) (artichoke); 6. large trees or shrubs (*šajar*), including garden or cultivated (*bostānī*) varieties, with usable fruits, e.g., *fostoq* (pistachio), *jawz* (walnut), *nārjīl* (coconut), *otrojj* (citron); 7. wild trees or shrubs with usable fruits, e.g., *balāḏor* (*Anacardium orientale* L.), *balīlaj* (belleric), *kazmāzaj* (tamarisk gall), *sabestān* (sebesten), *šāhballūṭ* (chestnut); 8. plants with usable flowers/blossoms (*anwār*), e.g., *bahrāmaj* (*Salix aegyptiaca* L.), *nasrīn/nesrīn* (dog rose, musk rose), *nīlūfar* (water lily); 9. plants with usable leaves, e.g., *āzā(d)-deraḵt* (azedarach), *sarv* (cypress), *zarrīn-deraḵt* (? lit. "golden tree"); 10. plants with usable root barks, e.g., *bahman* (*Centaurea behen* L.), *dīvdār* (deodar cedar), *darūnaj/dorūnaj* (doronicum), *sūrenjān* (colchicum), *sūsan asmanjūnī* (Florentine iris), *zarāwand* (birthwort); 11. plants with usable roots (bulbs, rhizomes, tubers; *oṣūl*), e.g., *baṣal* (onion), *korrāṯ* (leek), *saljam* (turnip); 12. plants from which oils (*adhān*); are obtained, e.g., *balasān* (balm), *šīraj* (sesame [oil]), *zanbaq* (*Jasminum sambac* Aitch.); 13. plants yielding various resins, latexes, extracts, etc., e.g., *afyūn* (opium), *anzarūt* (sarcocolla), *bārzad* (galbanum), *fīlzahraj* ([juice of] *Lycium afrum* L.), *kahrobāʾ* (yellow amber), *nīl/nīlaj* (indigo), *sakbīnaj* (sagapenum). Obviously, these imprecise groups sometimes overlap, as in the case of *rommān* (pomegranate), both the blossoms (*jollanār*, from Persian *gol-e nār*) and fruits of which were used medicinally. Most of the names of these simples are arabicized Persian (or persianized) terms.

A contemporary of Majūsī, the Persian Abū Manṣūr Mowaffaq Heravī (fl. ca. 370-80/980-90), author of *Ketāb al-abnīa ʿan ḥaqāʾeq al-adwīa*, the earliest known work in Persian on materia medica and nutriments, dealt with approximately 450 plants and materials of plant origin (without reckoning 16 equivalents and references). He declares (pp. 1, 4) that he has perused the pharmacological works of his Greco-Islamic predecessors as well as those of some Indian physicians. Consequently his treatise includes a lot of botanical drugs of Indian provenience under their Persian, persianized, or arabicized names, e.g., *aṭmaṭ/atmat* ("seeds [*sic*] of the Indian lotus," i.e., *Nelumbo nucifera* Gaert.), *bahman*, *balādor*, *berenj/baranj-e kābolī* (chebule

seeds), *beṭṭiḵ(-e) hendī*, *fūfal* (areca nut), *hīl-e būyā* (cardamon), *jawz jandom* (Pers. *gowz-e gandom*, manna lichen), *jawz(-e) māṭel* (thorn apple), *kabāba/kobāba* (cubeb), *ḵīār(-e) šanbar* (pods of the purging cassia, *Cassia fistula* L.), *ḵowlenjān/ḵūalenjān* (galanga), *māhīzahra* (lit. "fish poison," i.e., roots or berries of *Anamirta paniculata* Colebr.), *nārjīl*, *nār-mošk* (root bark of *Mesua ferrea* L.), *rībās* (rhubarb), *salīḵa* (bark of Ceylonese cinnamon), *ṭālīsfar* (twigs of yew), *zard-čūba* (Pers., lit. "yellow wood") or *ʿorūq ṣofr* (Ar., lit. "yellow roots"; turmeric). Levey (p. 105) thinks that, since in Heravī's time many physicians were Persians spreading his work to the Near East, he was "largely responsible for having brought Indian pharmacology to the serious attention of writers in Arabic."

Another Iranian figure in the transmission of botanico-pharmacological knowledge is Ebn Sīnā (370-428/980-1037; see avicenna). In the 2nd book of his *Qānūn fi'l-ṭebb* (I, pp. 243-470; Lat. tr., *Liber Canonis*, Basel, 1556, pp. 179-322), he has treated more than 800 simples, nutriments, and the like (Levey, p. 147), of which (excluding references and equivalent names) some 541 are plants, materials of plant origin, and vegetable nutriments. As a rule Ebn Sīnā does not care about the morphological description of plants, but he does provide precisions when differences in botanical varieties are pharmacologically relevant. In this respect be was not an original writer: his materia, on the whole, is "secondhand" (Levey, p. 109); however, he was a good systematizer of the materials which he had chosen to deal with. In view of his outstanding position in contemporary medicine, his pharmacological statements were often quoted by later authors. For instance, the Spanish Arab Abū Jaʿfar Aḥmad Ḡāfeqī (d. 1164), whose *Ketāb al-adwīa al-mofrada* ("Book of simples," only partly published) was the principal source of the *Jāmeʿ* of Ebn al-Bayṭār (d. 646/1248), frequently quoted him (Levey, p. 109), and Ebn al-Bayṭār himself, 300 times (p. 116).

Ebn Sīnā's contemporary and fellow countryman, Abū Rayḥān Bīrūnī, though not a practicing physician, combined his keen interest in pharmacy (*ṣaydala/ṣaydana*) with his vast philological knowledge to compile a work unique in its kind in the pharmacological literature of the Islamic period. His *Ketāb al-ṣaydana fi'l-ṭebb*, a mainly philological book on simple drugs, is primarily a pharmacological treatise in which he has culled extracts from a great many ancient and modern authors, some of whom are known to us only by name or whose pharmacological works are now lost. His materia medica, consisting of both previously known simples and new additions, includes

about 770 plants, materials of plant origin, and the like (excluding many synonyms and references). This number is all the more impressive when we note that the published text (see the bibliography) lacks the entries under the two letters *ḏ* and *r*. Another important feature of this work is the unprecedented abundance of equivalents for plant names, not only in classical languages (Greek, Latin, Syriac, Arabic, Persian, Turkish) but, more importantly, also in the languages or dialects of Balḵ, Bukhara, Gorgān, Ḵᵛārazm, Sīstān, Sogdiana, Termeḏ, Ṭoḵārestān, Zābol, etc., current in the author's time, as well as some Indian languages (Hindi, Sindhi, etc.). Bīrūnī's interest in botanical synonyms and in identifying the vernacular names of plants with those used in the better known languages reflects the need to cope with the confusion which had already set in with the Syriac and Arabic translations of Greek authors and which had steadily grown with the influx of new botanical drugs and their local names from very different lands. Of course, he was neither the first nor the last to have felt that urgent need: Contributions to botanical synonymy include Ebn Joljol's *Tafsīr asmāʾ al-adwīa al-mofrada men ketāb Dīsqūrīdūs* (Explanation of the names of the simples in the book of Dioscorides; comp. 982-83; now partly lost, see Sezgin, *GAS* III, p. 309), Ḡāfeqī's *Ketāb al-adwīa al-mofrada*, the *Šarḥ asmāʾ al-ʿoqqār* (Explanation of the names of simples) of Ebn Maymūn (Maimonides, 1135-1204), and Ebn al-Bayṭār's *Jāmeʿ*. (For detailed accounts of such works by physicians/pharmacologists of the Islamic period, see Meyerhof's introduction to Maimonides' *Šarḥ*, and Levey, chaps. 3, 6, and 9.) Bīrūnī himself mentions some now lost dictionaries of synonyms of drugs in his homeland in his days (ca. 440/1050): a multilingual glossary called *Dah nām*, which was supposed to provide ten names in ten different languages for each simple but which he found corrupted by the copyists and therefore useless (op. cit., Ar. text, p. 14); a glossary called *Poššāq šᵉmāhē* (Syr., Explanation of names) or *Čahār nām*, mainly used by the Christians, which provided four equivalents in four languages for each simple: Greek (Rūmī), Syriac, Arabic, and Persian (Bīrūnī says he has incorporated the greater part of its contents into his *Ṣaydana*; op. cit., pp. 14-15); and glossaries called *leksīqūnāt* (lexica), also used by the Christians, each of which usually explained the odd, difficult terms in a given scientific work (he says that the glossaries for Ptolemy's astronomical tables, Dioscorides' *Ketāb al-ḥašāʾeš*, and Oribasius's *Konnāš* were available to him (op. cit., p. 15). Bīrūnī's great merit in the *Ṣaydana* is to have gathered a lot of data from the eastern part of the Islamic world (the authors just mentioned were all native of Spain and their works are particularly valuable for old Spanish, western local Arabic, and Berber botanical equivalents), as well as a

wealth of interesting explanations, etymologies, and even valuable quotations from Arab poets referring to such and such a plant.

The next outstanding title in the history of Persian botanical-pharmacological contributions is the *Toḥfat al-moʾmenīn* of Moḥammad Moʾmen Tonokābonī (Ḥakīm Moʾmen), physician to the shah Solaymān Ṣafawī (r. 1077-1105/1667-94), a cyclopedia of pharmacology and pharmacy in Persian compiled in 1080/1669-70. The bulk of this work (pp. 29-881) consists of the description of Greco-Islamic materia medica (mostly botanical drugs), for the compilation of which the author has drawn on more than twenty-five Greco--Islamic and six Indian sources (see his authorities, pp. 4-5, 29), to which he had added the results of his own experimentation and investigation. The alphabetical materia medica section contains about 5,750 headings, including some 1,520 main entries, 940 of which deal with plants, botanical drugs, and nutriments of vegetable origin (cf. the figures in the *Jāmeʿ* of Ebn al-Bayṭār; 1,500 main entries plus about 1,000 synonyms and equivalents; see Leclerc, II, p. 230). In respect of botanical synonymy, the importance of the *Toḥfa* lies in the great number of equivalent names and synonyms (about 4,230) from many languages: Greek, Arabic (including the dialects of Ḥejāz, Yemen, Syria, Egypt, the Maḡreb, Andalusia, etc.), Hebrew, Syriac, Nabatean, etc.; Iranian languages or dialects (Persian, dialects of Khorasan, Isfahan, etc., and especially the Caspian dialects—ca. 126 items—, with which the author was particularly acquainted, see Tafażżolī); Turkish (ca. 190); and Indian (ca. 532). The addition of Turkish equivalents may be due to a rekindled interest of Safavid rulers in their ancestral mother tongue and origin, and the rather high number of Indian lexical and pharmacological materials probably indicates a renewal of interest in Indian medicine and drugs, as well as closer political and social ties with the neighboring India. An important feature of the *Toḥfa* is that each main entry usually begins with a morphological description, shorter or longer as the case may require; for instance, if the plant in question is subject to confusion, or if it has varieties, the descriptions are more detailed (examples s.vv. *abūḵalsā* [glasswort], *āḏān al-faʾr* [marjoram, etc.], *anjodān* [asafetida], *asārūn* [asarum], etc). Sometimes the author mentions personal experiment or expertise in identifying a plant; for instance, s.v, *bādranjbūya* (*Melissa officinalis* L.), when discounting its identity with the *bālangū*, which had been alleged by some authors, he states (p. 136) that he grew the seeds of the *bālangū* himself and saw that it was a kind of basil (*rayḥān*) with large green leaves, smelling like the sweet basil (*šāh-sefaram*). The following two quotations may give an idea about the botanical

descriptions and synonymy in the *Toḥfa*: "*Jawz māṯel* [thorn apple]: in Persian *tātūra* [from Indian]; arabicized from Persian *gowz-e māṯel*. Both wild and cultivated varieties exist. The plant is as large as that of the aubergine, but with smaller leaves. The flowers, white, look like those of . . . the convolvulus, but are longer. The fruits are as large as walnuts, thorny like those of the castor-oil plant, and contain grains like sumac grains. The part used are the grains, which are tasty" (there follow the medicinal properties; pp. 258-59). Synonyms include *jawz māṯem*, *jawz māṭā*, and others (p. 262); *dhātūra*, its Indian name (p. 399); and *morqed* (Ar., lit. "soporific"), a name also applied to the opium (p. 807). "*Ṯīl* [couch-grass]: in Turkish called *īlān-ūdī* [lit. "snake grass"], in Tonokābonī *kerk-e čar-e vāš* [lit. "grass nibbled by hens"]. It is a repent grass growing near water and in humid soil at any time of the year. Its stems are long, with many nodes. Its minute leaves grow at each node. The blossoms, pinkish, are interlaced with the leaves. It tastes sweet [there follow the medicinal virtues]" (p. 233). Synonyms include *ağrosṭes* (i.e., *agrostis*), its Greek name (p. 89); Persian *bīd-gīāh* (lit. "willow grass," p. 205); and Arabic *najm* and *najīl* (p. 842). The *Toḥfa* seems to have superseded a previously popular pharmacological compendium in Persian, the *Eḵtīārāt-e badīʿī*, composed in 770/1368-69 by ʿAlī b. Ḥosayn Anṣārī (better known as Ḥājj Zayn-e ʿAṭṭār "the Apothecary"), whom he often cites to point out mistakes and misinformation.

The contributions of Persian scholars to traditional medicinal botany culminated in the work of Moḥammad-Ḥosayn ʿAqīlī Ḵorāsānī, author of the *Maḵzan al-adwīa* (On simples, comp. 1183/1769-70) and the *Majmaʿ al-jawāmeʿ wa ḏaḵāʾer al-tarākīb*, commonly known as *Qarābādīn-e kabīr* (The great formulary), on the art of pharmacy and on compound drugs. Together these two form a vast encyclopedia of pharmacology in Persian. The *Maḵzan* is basically an amplified and systematized adaptation of the *Toḥfat al-moʾmenīn*, to which ʿAqīlī has added information from a few sources probably unknown or unavailable to Tonokābonī (e.g., Ebn Sīnā's *al-Adwīa al-qalbīya* "Cardiac drugs"), and a few works posterior to the *Toḥfa* (see his authorities, p. 3). ʿAqīlī's own observations, particularly rich in the case of Indian materia medica, are also included, cf., e.g., his detailed botanical treatment of Indian material such as *balādor*, *bīš* (aconite), and *dīvdār* (op. cit., s.vv). ʿAqīlī is probably the first pharmacological writer in the Islamic world to have utilized, at least in some cases, the New Latin (which he calls *farangī*) scientific botanical terms for the identification of plants, probably inspired by the botanico-pharmacological activity of British scientists in India, e.g.:

"*Dolb* [plane tree] . . . is called *čenār* in Persian and *balaṭānos* [*Platanus*] in *farangī*" (p. 422). "*Lesān al-ḥamal* [plantain]: . . . It occurs in two species, large and small. The large one is called *balantāg mayūr* [misprinted *bīšāk maysūr*; *Plantago major* L.] in *farangī* and the small one *balantāg mīnūr* [misprinted *bīšāk mīnūr*; *Plantago minor* L.]" (p. 788). "*Šahesfaram* [(sweet) basil] is called . . . *osīmom* [misprinted *osmīm*; *Ocimum* spp.] in *farangī*. The species having large leaves is called *osīmom māgnūm* [*Ocimum magnum*], and the one with tiny leaves, *osīmom pārvom* [misprinted as *osmīm bārūm*; *Ocimum parvum*] in *farangī* (p. 539).

In this period also some non-pharmacological works have dealt with some aspects of plants. The most celebrated is the *Ketāb al-nabāt* (The book of plants) of Abū Ḥanīfa Dīnavarī, a famed Iranian philologist and historian of the 3rd/9th century. This mainly philological work has two parts, both of which have come down to us in defective manuscripts: The first treats extensively the Arabic terminology of subjects more or less related to plant life and products, a separate chapter being devoted to each. The other contains a treatment of plants and the relevant Arabic botanical terminology and synonyms. The extant portion of the first part includes thirteen chapters, dealing with, e.g., mushrooms and truffles, gums, plants used in tanning and for making ropes and cords, plants yielding dyestuffs, and vegetable aromatics. The extant portion of the alphabetical part covers only the first eleven letters of the Arabic alphabet (from *alef* to *zāʾ*) and contains 482 entries, in which about 440 plants and botanicals are dealt with (the remaining entries consist of synonyms, references to the topical part, and short notes). Further, a collection has been made by M. Hamidullah of the entries under the other letters of the alphabet as quoted in the works of later authors. This collection, presented under 637 entries, contains more or less fragmentary statements about 507 plants and the like (excluding about 130 synonyms and references). Thus we get a total of about 947 botanical main entries. Dīnavarī is essentially interested in the plants and plant products of the Arab lands (*arż al-ʿArab*) and in their vast terminology. He does, however, also provide some information about "exotic" plants and Persian or other Iranian equivalents for many Arabic plant names. The following short quotations will give an idea about the alphabetical botanical part of his work: "*Oqḥowān* [*Matricaria parthenium* L.]. The *nomen unitatis* is *oqḥowāna*, the plur. is *al-aqāḥīy* or *al-aqāḥī*." Then after citing five poetical evidences for the use of either variant of the plural, he quotes from the grammarian Farrāʾ two spelling variants when the article *al-* -

is added: *al-oqḥowān* and *al-qoḥwān*; then he goes on, "I asked a Bedouin about the *oqḥowān*. He said: "It is your *bābūnaj*, which the people of the Jabal call *banīrak* [i.e., Pers. *panīrak*]." ʿAbū Naṣr [Aḥmad b. Ḥātem Bāhelī] has said: "It is also (called] *bābūnak*." According to Abū ʿAmr [b. al-ʿAlāʾ], the *oqḥowān* is one of the "males" [*ḏokūr*, i.e., inedible plants], and it grows both in hard and soft soils. . . . [The Bedouin] Abū Zīād told [me]: "The *oqḥowān* is a herbaceous plant (*ʿošba*); both its leaves and pure white flowers are fragrant all the time . . . Its leaves are twisted, not flat, like those of the *šīḥ* [*Artemisia judaica* L.]" (pp. 29-30). "*Aṣābeʿ al-qaynāt* [*Melissa calamintha* L.?]: It is the aromatic plant called *faranja-mošk* in Persian. It is abundant in the remotest parts of Arab lands. It grows wild, [but] it is not grazed by any [animal]. I was informed of all this by a Bedouin inhabiting that region" (p. 41). "*Eṭrār* : One of the Bedouins informed me that it is a plant which they call *anbarbārīs*, i.e., that which is called *zarīk* in Persian" (p. 42),

Another motive for non-pharmacological interest in plants was agriculture and gardening. A relatively small number of agricultural works in Arabic in the Islamic period are recorded in bibliographies (Watson mentions six; see his bibliography, pp. 215-23). Only a few of these works have been published so far, the best known being *al-Felāḥa al-nabaṭīya* (Nabatean agriculture), attributed to Ebn Waḥšīya (3rd/9th cent.?), *al-Felāḥa al-rūmīya* (Byzantine agriculture), translated from the Greek of "Qoṣtos al-Rūmī" (probably Cassianus Bassus, fl. a.d. 6th cent.), and the *Ketāb al-felāḥa* (Book of agriculture) of Ebn ʿAwwām of Seville (fl. 12th cent.). Agricultural works in Persian are not more numerous: Monzawī, *Nosḵahā* I, pp. 392-459, records six manuscripts of any interest in historical perspective, including the *Varz/Barz-nāma* (Book of agriculture), reportedly a Persian version of *al-Felāḥa al-rūmīya*. Only two of these works have been published: The one dealing specifically with Iran (the Herat region) is the *Eršād al-zerāʿa* (Guide to agriculture), composed in 921/1515-16 by Qāsem Abūnaṣrī Heravī. Abūnaṣrī deals with 79 plants (cereals, vegetables, fruit trees, ornamental trees, flowers, medicinal plants, etc.). The importance of this work from a botanical viewpoint lies in the fact that the author did not confine himself to botanical species but dealt with the varieties or cultivars of many plants as known in the area of his native Herat. The number of the cultivars he names and defines for some plants is impressive, e.g., over 100 varieties of grapes, approximately 58 varieties of *ḵarboza* (a kind of melon), about 33 varieties of apricot, 19 varieties of wheat and apple, 14 varieties of *kadū* (pumpkin, squash) and barley, 11 varieties of millet, and 6 varieties of watermelon.

A few authors turned their attention to the "marvelous" plants of the world and especially to agricultural and medicinal "marvels" (*ʿajāʾeb*) of a number of known plants. Probably the best known of these authors is Zakarīāʾ Qazvīnī (ca. 600-82/ca. 1203-83), who in his *ʿAjāʾeb al-maḵlūqāt* occasionally reported the existence of some fabulous plants (e.g., the *yabrūḥ*, mandrake), as well as some real ones with marvelous virtues (e.g., the *jawz māṯel*, datura, an inedible, fatally poisonous plant). Concerning the *yabrūḥ* he reports the following on the authority of "the author of *Toḥfat al-ḡarāʾeb*" [?]: "There grows in the mountains of Farḡāna a plant in the form of a human being; part of it looks like a man and part of it like a woman. A lot of this plant is found with mountebanks, who extol it, saying that eating it increases the sexual power. It is called *yabrūḥ* and abounds in Ḵorāsān" (pp. 169-70). Concerning the *jawz māṯel*, on the same authority (p. 167): "In the mountains of Ṭabarestān there is a plant called *jawz māṯel*. If somebody cuts [a piece of] it while laughing and eats it laughter will overwhelm him; if he does so while crying weeping will overcome him; while dancing, likewise. In whatever state somebody cuts and eats it, that state will overcome him." Qazvīnī has a special chapter on a number of ordinary plants (pp. 246-301), which he has divided into *šajar* (i.e., plants with a hard tall stem) and *najm* (i.e., those without such a stem)—probably in imitation of the same bipartite division in the Qurʾān (55:6). He mentions 62 *šajar* and 121 *najm*. For the former, apart from an occasional concise description, he usually quotes agricultural hints from "the author of *al-Felāḥa*" (most probably *al-Felāḥa al-nabaṭīya*), and medicinal virtues from Ebn Sīnā's *Qānūn*. For the latter, he usually confines himself to quoting wondrous-sounding properties from the *Qānūn*. Examples of agricultural hints that will work wonders as claimed by "the author of *al-Felāḥa*" are: If a red rose bush is planted under an apple tree the apples will become red (p. 250); soaking a walnut for five days in the urine of a sexually immature boy, then sowing it and sprinkling ashes on it will yield a tree that will produce walnuts with thin shells easy to crack by hand (p. 252).

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