

## OLIVE OIL AND OTHER SORTS OF OIL IN THE MYCENAEAN TABLETS\*

1. In 1978 an International meeting on «Olive Oil in Antiquity» was planned and subsequently held at Madrid in December, 4-6. I was asked by Professor M. F. Galiano to contribute on the Mycenaean evidence concerning olive oil, and, although I was finally unable to attend the meeting, I sent my contribution, an expanded version of which was published in the Proceedings in due course. My communication was intended to produce an early survey of the long olive oil history, pertaining at least to the earliest European occurrence of oil documents. I was aware that records of an earlier date do exist as well, but either they are of very difficult interpretation, like those in Linear A, or of little significance, as those mentions of a *sirdu* plant in Mesopotamian records, probably an olive tree. When I was writing my paper, Third Millenium B.C. evidence from Ebla was not available to me yet, but a passing mention of it is now included, when significant.

Since I was not allowed by the editor of these proceedings to correct the proofs, my printed contribution «El aceite en la civilización micénica», *Producción y comercio del aceite en la Antigüedad*, Ed. de la Univ. Complutense, Madrid 1981, pp. 255-282, is actually almost useless. This is why the following represent an English version of it only slightly modified. And since I am well aware that the Spanish version is not easy to read, because botanical and technical terms are involved, I hope the present version will not be otiose.

2. It is by no means sure that the Mycenaeans knew and used such oleaginous plants as castor, opium poppy, and so on<sup>1</sup>.

\* My thanks are due to my colleague John Tynan, who has kindly improved my English translation.

<sup>1</sup> L. R. Palmer, *The Interpretation of Mycenaean Greek Texts*, Oxford 1963 [hereafter *Interpretation*], p. 246, has already interpreted such ligatures as OLE + A, + PA, and

The castor plant (*Ricinus communis* L.) yields beans from which castor oil is extracted. These beans contain 35 to 55 per cent of thick, yellowish oil obtained by squeezing them out<sup>2</sup>. In Ancient Egypt castor oil was the current oil for the poor, although it was employed mainly in industry, since castor oil is particularly suitable for making unguents. On the other hand, its medical utility as a purgative is well known. Herodotus (II.94) recorded that Egyptians used castor oil (κίκι) for ointment: Ἀλείφατι δὲ χρέωνται Αἰγυπτίων οἱ περὶ τὰ ἔλαια οἰκέοντες ἀπὸ τῶν σιλλικυπρίων τοῦ καρποῦ, τὸ καλεῦσι μὲν Αἰγύπτιοι κίκι, ... Elsewhere he records also its usage in lighting: ἔστι δὲ πῖον καὶ οὐδὲν ἥσσον τοῦ ἐλαίου τῷ λύχνῳ προσηνές, ὁδμὴν δὲ βαρέαν παρέχεται, cf. Dioscorides I.32.

It is worth quoting that Dioscorides (IV.161) mentioned the denomination 'wild sesame' as another name for castor oil (κίκι· οἱ δὲ σήσαμον ἄγριον, οἱ δὲ σέσελι Κύπριον, οἱ δὲ κρότωνα...; but see the next paragraph for sesame).

The opium poppy (*Papaver somniferum* L.) was widely known during the II Millenium B.C. in the East Mediterranean area<sup>3</sup>. Besides the opium, this poppy yields an oil, which is obtained by cold pressing from its seeds, the resulting white oil being edible. A hot pressing of the opium seeds yields a reddish oil used in lamps, as a soap and as a vehicle for paints<sup>4</sup>.

+PO as different types of oil used by the Mycenaeans as vehicles for unguents; on the contrary, the plain ideogram OLE would stand for olive oil. According to him, OLE+A would represent oil from the *Balanites aegyptiaca* L. (Greek ἀμύγδαλα), so appreciated by Classical *unguentarii*, for its index of grease low, whereas OLE+PO would stand for some kind of palm oil, φοινίκιον ἔλαιον. These interpretations are hardly endorsed, cf. § 17.

<sup>2</sup> Cf. A. F. Hill, *Economic Botany*<sup>2</sup>, 1951 (Spanish translation = *Botánica económica*, Barcelona 1965 [hereafter *Botánica*, since pages are quoted according to the Spanish version], pp. 233-234.

<sup>3</sup> R. Merrillees, «Opium Trade in Bronze Age Levant», *Antiquity* 36, 1962, pp. 287-292, has shown that opium trade from Cyprus was intense, this drug being handled in small vessels resembling poppy capsules. I. Vicentelli, «Alašia: per una storia di Cipro nell' età del Bronzo», *Studi Ciproiti e Rapporti di Scavo* 2, 1976, p. 27, has put forward that opium is meant by using the word *gayatum* in Hittite records and at Nuzi (*gaḫātu*). Sundwall was wrong in identifying GRA ideogram as 'poppy capsule'. Homer knew the opium plant, cf. *Il.* 8.306: μήκων δ' ἐτέρωσε κάρη βάλεν ἐνὶ κήπῳ. Cf. P. Kritikos and S. Papadaki, «Μήκωνος καὶ ὀπίου ἱστορία», Ἱστοριογραφικὴ Ἐφημερίς, 1963, pp. 80-150.

<sup>4</sup> A. F. Hill, *Botánica*, p. 229.

In the present incomplete review of the Mycenaean oleaginous plants *ki-ta-no* is not taken into account. *Ki-ta-no* is probably a member of the *Pistacia* family, and Timaeus (*de mir. ausc.* 88) quotes the usage by the inhabitants of Balearic Islands of an oil obtained from the turpentine tree. Both Xenophon (*Anab.* IV.4.13) and Theophrastus (*HP* 3.3.1) mention turpentine fruits as an ingredient for perfumes and unguents<sup>5</sup>. While still used today in balsams, the products of the *Pistacia* family are to be strictly considered as oleoresins (*P. Lentiscus*, only 2 per cent of essential oil; *P. Terebinthus*, 14 per cent)<sup>6</sup>.

3. Among the oleaginous plants recorded in the Mycenaean tablets, sesame (*Sesamum indicum* L.) is attested in records from Mycenae (Ge 602, 605, 606)<sup>7</sup>. It is clear that *sa-sa-ma* (sometimes abbreviated by means of syllabogram SA, cf. Ge 603, etc.) stands for /sāsama/, plural neuter nominative 'sesame seeds', cf. σήσαμον Hipponax +, and Dor. σᾶσαμον. Such a phytonym is not attested in Homer, who instead mentions a town or spot in Paphlagonia bearing the name Σήσαμος (*Il.* 2.853).

The numerous, ovoid sesame seeds contain 50 per cent of semidrying, lemon yellowish, aromatic oil, which is easily obtained by successive cold squeezing<sup>8</sup>. Its usage in II Millenium staple is well determined in the Mesopotamian documents not only in the form of sesame oil, but also as a flavouring<sup>9</sup>. The very phytonym declares its status as a *mot voyageur* in Mycenaean, and it is likely

<sup>5</sup> Cf. J. L. Melena, «KI-TA-NO en las tablillas de Cnoso», *Darius* 2:1, 1974, pp. 45-55, and also «La producción de plantas aromáticas en Cnoso», *Estudios Clásicos* 78, 1975, pp. 180-183.

<sup>6</sup> Em. Perrot, *Matières premières du règne végétal*, Paris 1943-1944 [hereafter *Matières*], pp. 1309 ff.

<sup>7</sup> See M. Wylock, «Les aromates dans les tablettes Ge de Mycènes», *SMEA* 15, 1973 [hereafter «Les aromates»], pp. 115-118, where an excellent survey on sesame is included as a background for the Mycenae sesame evidence.

<sup>8</sup> A. F. Hill, *Botánica*, p. 231; Em. Perrot, *Matières*, pp. 1968-1974. This oil is immediately edible and palatable. It was used in perfume making as maceration ('enflourage') oil for extracting certain scents, cf. Theophrastus, *de od.* 14.20.

<sup>9</sup> J. Bottéro, *Archives Royales de Mari. VII: Textes économiques et administratifs*, Paris 1957, p. 253. Only small sesame quantities (ranging from 10 l. in 94 to 20 l. in 141) *a-na a-ka-li-ja* 'for meal' are attested, perhaps intended to be sprinkled on meal. Compare these quantities (in a country where sesame is the main oleaginous plant) with those occurring on Ge tablets.

that both name and plant (and its usages as well) might be traced back to an Oriental source, cf. Akk. *šammašammu*, Ugar. *ššmn*<sup>10</sup>.

At present we do not know at all the purpose(s) of these sesame entries appearing on the Mycenae tablets; the minuteness of the quantities recorded (they range from 1 to 5 litres) prevents probably an industrial interpretation (i.e. to be ground and subsequently squeezed out for oil). The records concerned present a fiscal appearance, and the sesame deliveries seem to be based on a fixed quota susceptible of being doubled (z 2 = 0.8 l.; v 1 = 1.6 l.) for each man. It is easily seen that the total amount obtained by summing up every entry on each record (MY Ge 602 = 4.8 l.; 604 = 4 l.), reaches a similar order as the joint recording on MY Ge 606 (= 5.4 l.) which is marked in its heading as *do-si-mi-ja* / *dosmia* / 'contributions'.

If an industrial purpose is therefore to be ruled out, these small quantities of sesame seeds were to be employed as a flavouring, either as a sprinkle on cakes or the like (as used today in Greece and attested in Classical times, cf. Aristophanes, *Achar.* 1092, *Pax* 869, &c.) or as sweets, honey probably being used in their manufacture as a vehicle and sweetening. Nevertheless, a final statement on the purpose(s) of the commodities recorded on the Mycenae Ge tablets is far from being attained<sup>11</sup>.

4. Another oleaginous plant recorded on the same Mycenae tablets is safflower (*Carthamus tinctorius* L.), which is the source of the lesser saturated among the vegetable oils<sup>12</sup>. Pliny (*NH* 21.90) transmits the news that the Egyptians obtained from safflower seeds an oil which they found extremely palatable. On the tablets, safflower is recorded by means of the word *ka-na-ko*, Ge

<sup>10</sup> See E. Masson, *Recherches sur les plus anciens emprunts sémitiques en grec*, Paris 1967, pp. 57-58, where relevant literature is discussed.

<sup>11</sup> Cf. J. T. Killen, review of *The Mycenae Tablets III* in the *Classical Review* 14, 1964, pp. 171-173, and recently «On the Mycenae Ge Tablets», *Res Mycenaeeae*, edd. A. Heubeck & G. Neumann, Göttingen 1983, pp. 216-232, and my own comments, *ibidem*, pp. 232 f. M. Wylock, «Les aromates», interpreted the Mycenae spices as flavourings for the kitchen. It is noteworthy that sesame is only attested at Mycenae, a fact that fits well in with the exclusive occurrence of *Sesamum indicum* L. in Argolis, cf. Boissier, *Flora orientalis* IV, p. 81.

<sup>12</sup> A. F. Hill, *Botánica*, p. 229; H. G. Baker, *Plants and Civilization*, Belmont 1965 [Spanish translation, México 1968; pages are quoted from that Spanish version], pp. 109-110, and M. Wylock, «Les aromates», pp. 118-125.

602 &c. (and of a ligature *KANAKO* Ge 608 as well), standing clearly for /knākos/, cf. κνήκος 'safflower' in Hippocrates. This word *ka-na-ko* occurs along with two adjectives: *e-ru-ta-ra* /eruthrā/ 'red (safflower)' and *re-u-ka* /leukā/ 'white (safflower)', *ka-na-ko* being feminine in Mycenaean. Such a double description fits in the Hesychius' gloss κνήκος: τὸ κρόκιζον χρώμα, ἀπὸ τοῦ ἄνθους, ὅτε δὲ ἀπὸ καρποῦ, τὸ λευκόν; it seems clear then that weighed entries of *ka-na-ko e-ru-ta-ra* correspond with the red florets of safflower, which were possibly to be used as a colouring matter in the Mycenaean textile industry<sup>13</sup>. On the contrary, entries of *ka-na-ko re-u-ka*, recorded by means of dry measure, clearly refer to the seeds. As a matter of fact, safflower is a plant of the family of Compositae and seeds from safflower have already been found in Egyptian tombs dating back to the II Millenium B.C. Safflower fruits contain only one seed each; they are white, smooth aquenia grown in the flower heads; they contain 24-36 per cent of oil, which is edible and has industrial usages as well, for safflower oil is a drying oil.

As in the case of sesame entries, safflower quantities recorded are low, and similarly we are not allowed to assume that the Mycenaean used these amounts in obtaining oil to be used either in cooking or in industry<sup>14</sup>. J. T. Killen pointed out the possibility that these Mycenae Ge tablets belonged somehow to the Palace Kitchen: they might record flavourings to vary an insipid diet<sup>15</sup>. If the red and white safflower quantities are to be viewed from such a perspective, florets might be used as a colouring—a cheap substitute for saffron—and seeds might be explained as well in this way, cf. Apicius, *de re coquinaria* I.11.1, who says that safflower ground to flour and

<sup>13</sup> Cf. C. Murray and P. Warren, «*PO-NI-KI-JO* among the Dye-Plants of Minoan Crete», *Kadmos* 16, 1976, pp. 40-60, esp. 45-47. The identification of *po-ni-ki-jo* as madder, *Rubia tinctorum* L., is discussed in my monograph *Dyes and Dyeing in the Mycenaean Textile and Leather Industry* [forthcoming].

<sup>14</sup> M. Wylock, «Les aromates», p. 125.

<sup>15</sup> *Op. cit.* in note 11. Nevertheless, it must be kept in mind that M. Levey, «Perfumery in Ancient Babylonia», *Journal of Chemical Education* 31, 1954, p. 374, has already pointed out that most of the technology, artifacts and ingredients in the Mesopotamian perfume making can be directly traced back to the kitchen. Lewey himself pointed elsewhere (*Chemistry and Chemical Technology in Ancient Mesopotamia*, Amsterdam 1959, p. 55) that coriander, thyme, fennel, anise and cumin, all of them currently employed in the kitchen, might be similarly used as scents in perfume making.

mixed with honey acted as a preservative in pastry, and elsewhere (VI.5.2; VII.6.2) he mentions safflower as an ingredient for sauces. That safflower was actually employed in cooking, is transmitted by Dioscorides (IV.188), [σπέρμα λευκὸν καὶ πυρρόν]... τούτου τῷ ἄνθει χρῶνται εἰς τὰ προσοψήματα, but with an emphasis on its colouring properties.

5. Another oleaginous plant occurring on the tablets is flax (*Linum usitatissimum* L.), from whose seeds linseed oil is extracted. Since the Middle Ages linseed oil is used as a vehicle for paints and varnishes<sup>16</sup>. Evidence concerning flax as a textile plant is wide and rich in Mycenaean records, since there is a number of tablets which collect manufactured linen<sup>17</sup>. Nevertheless, we have no sure mention referring to linseed, in spite of the efforts by L. R. Palmer<sup>18</sup>. At Pylos SA stands ideographically for a flax produce and appears to be counted, whereas at Knossos SA represents a commodity weighed<sup>19</sup>. In both centres and cases, it seems clear that linseed is not intended, since we would expect that linseed should be measured by dry measure. SA stands therefore for raw flax and/or retted fibre or linen thread.

But the interpretation of tablet MY Ge 610 by L. R. Palmer might produce an attestation for linseed<sup>20</sup>. This record lists entries of an undetermined liquid commodity accounted for by means of ideogram \*134, which recurs at Knossos (U 5592), and might be traced back to Linear A. On the verso of the tablet at issue there appears a syllabogram RI, which according to L. R. Palmer hardly represents anything more than an acrophony for *ri-no* /linon/ 'flax'. Therefore we are told implicitly that \*134 might represent 'linseed oil'.

Nevertheless, there are some difficulties relating to the interpretation of ideogram \*134<sup>21</sup>. It must be stated that the ap-

<sup>16</sup> R. Ramella, *El lino oleaginoso*, Buenos Aires 1944; Em. Perrot, *Matières*, pp. 1098-1115; R. J. Forbes, *Studies in Ancient Technology* III, p. 7.

<sup>17</sup> See for instance A. Sacconi, «A proposito dell' epiteto omerico ΛΙΝΟΘΩΡΠΗΣ», *ŽA* 21, 1971, pp. 49-54. For a general survey see W. F. Legget, *The Story of Linen*, New York Chemical Publ. 1949.

<sup>18</sup> *Interpretation*, pp. 274 and 312.

<sup>19</sup> Cf. my review of *Documents*<sup>2</sup> in *Minos* 15, 1976, p. 237.

<sup>20</sup> *Interpretation*, p. 274.

<sup>21</sup> Cf. J. T. Killen, review *cit.*, p. 171. P. Hr. Ilievski, «The Linear B Ideogram \*134», *ŽA* 15, 1966, pp. 271-280, has studied the detail both \*134 and \*190 in considering them merely variants of one and the same ideogram which might stand for 'tallow'. I think that Ilievski's interpretation is unlikely, and I shall return to \*190 elsewhere.

pearance of \*134 resembles closely that of ideogram \*190, and even that both ideograms are merely variants of one and the same ideogram has been already suggested. The facts are that \*190 (MY Oi 701 &c.) is counted, and the commodity concealed was delivered to various craftsmen (fullers, kyanos-workers) in a fixed rating according to the addressees concerned. \*134 is also counted at Knossos, but this is all we can infer from the meagre evidence. On the contrary, \*134 is accounted for at Mycenae by means of liquid capacity measures, and disbursements of this \*134 liquid commodity were sent to certain individuals who receive elsewhere quantities of wool. On the basis of such a difference in accounting, it is tempting to assume that KN \*134 conceals one and the same commodity as MY \*190, this commodity counted being distinct from that which MY \*134 stands for. As results, we have no other evidence for checking the interpretation of MY Go 610 by Prof. Palmer, and the subsequent identification of MY \*134 as 'linseed oil'.

Anyway, as far as we know, we have no sure basis for a Mycenaean industrial use of linseed for obtaining linseed oil to be used either as a wood preservative or as a medium for paints and varnishes (in fact this latter usage is only attested since Late Antiquity)<sup>22</sup>. Besides this industrial linseed oil, obtained by hot pressing, there is another linseed oil extracted by cold squeezing, and such an oil is used in cooking.

6. From the above examination (§§ 2-5) it is clear enough that the Mycenaean knew a series of oleaginous plants, from which edible and/or industrial oils might have been obtained. Nevertheless, the recorded quantities concerning these plants do not allow us to elicit one of them as a main oleaginous plant, contrarily to the state of things attested in other civilizations (e.g. sesame in Mesopotamia). This secondary status of the plants reviewed is prompted by the presence of another oleaginous plant, whose importance as a source of oil reduces the remaining plants to a subsidiary function in the production of oil or even to spheres distinct from that production of oil. We are referring to the olive tree and to its produce, the olives, from which olive oil is pressed.

<sup>22</sup> R. J. Forbes, *op. cit.*, p. 256.

The olive tree is of course the oleaginous plant *par excellence* in the Mediterranean area.

7. The various records of olives are accounted for on the tablets by means of ideogram \*122. Sir A. Evans did not discern this ideogram, but dealt with the instances of \*122 along with those of ideogram \*144 CROC, standing for the commodity 'saffron'<sup>23</sup>. Both the elucidation of systems of measures made by E. L. Bennett and the decipherment of Linear B allowed \*144 CROC to be kept apart from \*122, the latter being conventionally transcribed as OLIV. \*122 OLIV entries were recorded by dry measure vs. \*144 CROC entries which are weighed; on the other hand, KN F 841.6 offers a clear context for the identification of \*122 as standing for olives: *e-ra-]wa* OLIV 46 *e-ra-wa[ /elai]wās* OLIV 46 *elaiwās/[ , /elaiwās/* probably a genitive 'of olive tree (sc. fruits)' (see § 25).

Obviously olives (and olive oil as well) were also recorded in Linear A documents. In fact there is a Linear A sign, *L49*, which resembles both \*122 and \*144, hence it has been much debated whether \*122 or \*144 is to be traced back to *L49*, and subsequently whether *L49* entries stand for olives or for saffron. J. S. Sundwall follows the identification by Evans of *L49* as 'Krokuspflanze', and Pugliese Carratelli does as well<sup>24</sup>. W. C. Brice endorses also this identification by Sir Arthur<sup>25</sup>. On the contrary, J. Raison and M. Pope identify the sign *L49* with Linear B \*122 OLIV<sup>26</sup>, and similarly D. A. Was<sup>27</sup>. From an incomplete examination of Linear A tablets showing *L49* it seems quite clear that the sign at issue stands for 'olives', as can be inferred from its association with oil entries and other agricultural produces as well, cf.

<sup>23</sup> *The Palace of Minos*, London 1935, IV, pp. 718 ff.

<sup>24</sup> *Monumenti Antichi dell' Accademia dei Lincei* 40, 1945 = *Le iscrizioni preelleniche di Haghia Triada in Creta e delle Grecia peninsulare*, pp. 421-610, esp. p. 468, and tables I-XXXVII, and J. S. Sundwall, «Minoische Kulturzeichen aus H. Triada», *Humaniora* 14, 1942, p. 17.

<sup>25</sup> *Inscriptions of the Minoan Linear Script of Class A*, Oxford 1961; «The Linear A Tablets IV 8 and IV 9 from Tylissos», *Kadmos* 8, 1969, pp. 125 ff.












<sup>26</sup> *Index du Linéaire A*, Roma 1971, p. XV note 44.

<sup>27</sup> «Olives to Pay Minoan Labour», *Minos* 14, 1975, pp. 7-16, and see also «Numerical Fractions in the Minoan Linear Script A. V. Olive Oil and Related Commodities», *Kadmos* 13, 1975, pp. 95-116.



HT 14, 21, 44, 50, 58 (it is more likely that tablet HT 123a records the income from a crop of olives along with the deficits as the totals assessed).

TABLE I

|   |   |   |   |   |   |   |
|---|---|---|---|---|---|---|
| LINEAR A OLIV   |   |   | OLIVE FLOWER RACEME<br>( <i>O. europaea</i> ssp. <i>oleaster</i> )                  |   |   |   |
|  |  |  |  |   |   |   |
| LINEAR B *122 OLIV  |   |   |   |   |   |   |
|  |  |  |    |  |  |  |
| OLIV<br>Uc 161  | OLIV + TI<br>F 853  | OLIV + A<br>F 852   | OLIV + TI<br>F 851  | OLIV + A<br>ms 102  | OLIV + A<br>ms 103  | + TI  |

Ideogram \*122 OLIV (see Table I) represents pictorially the peculiar flower of the olive tree: its whitish flowers are carried in small upright clusters, and each flower shows a cyathiform four-lobed calyx, which appears as three-lobed in the front perspective drawing of ideogram \*122<sup>28</sup>. A. Möbius has collected the Minoan pictorial representations of olive and wild olive<sup>29</sup>.

Plain ideogram OLIV occurs seldom on the tablets, but often in ligature with a couple of syllabograms, *TI* and *A*, to refer probably to distinct kinds or qualities of olives. *TI* appears as an exclusive ligature of ideogram OLIV, whereas *A* recurs as a ligature with ideogram OLE 'olive oil' as well, although there is the possibility that it might refer to two different items (see § 14) [we leave aside the ligatured \*209<sup>vas</sup> + *A*, for *A* stands acrophonically here for the Mycenaean name of the vessel concerned, *a-pi-po-re-we* plu. /amphiphorēwes/ 'amphorae'].

As to the olive ligatures *TI* and *A*, J. Chadwick has recently advanced the possible interpretation of *A* as standing for ἄγριος 'wild' and *TI* as for τιθασός 'domesticated'. The main objection to

<sup>28</sup> Cf. A. Huxley and W. Taylor, *Flowers of Greece and the Aegean*, London 1977, pp. 115 f. and ill. 503 and 504 (especially 504 illustrating the wild olive flower); O. Polunin and A. Huxley, *Flores del Mediterráneo* (Spanish transl., Madrid 1978, p. 159 and ill. 382). A. Dodds Niebuhr, *Herbs of Greece*, Athens 1970, p. 66.

<sup>29</sup> «Pflanzenbilder der Minoischen Kunst in botanischer Betrachtung», *Jahrb. d.d. Arch. Inst.*, 1933, pp. 12-14, and ill. 7.

such a proposal is, in Dr. Chadwick's view, that OLIV + *A* entries were far more important than those of OLIV + *TI*, a fact that seems to clash with the common sense picture, for fruits from wild olives are smaller, harder and worse than those from the cultivated plant, and therefore were not to be picked up in great quantities<sup>30</sup>.

8. The Ancient Greeks knew various kinds of olive; they seem to discern also distinct kinds of *wild olive*:

a) A shrub named φυλία in *Od.* 5.477f.

δοιούς... θάμνους

ἔξ ὁμόθεν πεφυῶτας ὁ μὲν φυλῆς, ὁ δ' ἐλαίης.

appears along with a cultivated olive tree; φυλία seems to be another name for a wild variety of olive perhaps to be kept apart from *b*), since Pausanias (2.3.2.10), who spelt it as φυλλία, claims that such a name is epichoric at Troezen. Scholia B, P, Q and T *ad loc. cit.* run as follows: φυλία εἶδος ἐλαίας, μυρρίνης ὅμοια φύλλα ἐχούσης, οἱ δὲ τὸ ἀγριέλαιον λέγουσιν. Myrtle has dark green, leathery, and shiny oval leaves, and it is fairly certain that this φυλία is a wild olive, ἀγριέλαιον, whose leaves, smaller, shorter than the cultivated plant, are narrow-oblong or even oval<sup>31</sup>.

b) The wild olive is named κότινος in Greek texts, cf. Aristophanes, *Av.* 621, *Plu.* 943, &c. It is distinguished from *c*) by scholion *ad Plat. Phaedr.* 236b, but Dioscorides (I.105) has both *b*) and *c*) the same.

c) Another name for the wild plant is ἀγριελαία (or ἀγριέλαιον), cf. Hippocrates, *Mul.* 2.222, and Dioscorides, *loc. cit.*

An adjective φαύλιος often qualifies the fruits from *b*), cf. Theophrastus, *CP* 6.83, *HP* 2.2.12. The basic meaning of φαύλιος is 'coarse', and φαυλία ἐλαία and φαυλία alone refer to a coarse kind of olive produced from the κότινος (LSJ).

On the other hand, there is the cultivated plant ἐλαία which was derived from the wild tree (see § 9). Plutarch (*Fab.* 20) uses a

<sup>30</sup> *The Mycenaean World*, Cambridge 1976, pp. 121 ff.

<sup>31</sup> Cf. A. Huxley and W. Taylor, *op. cit.*, p. 108 and ill.177; A. Dodds Niebuhr, *op. cit.*, p. 49.

verb τιθασεύω for the transformation of wild olives into cultivated plants: κοτίνους εἰς ἐλαίας ἐξημεροῦντες καὶ τιθασεύοντες. The adjective τιθασός is used of plants with the meaning of 'cultivated, reared in gardens' (LSJ), that is, it refers to any plant cultivated by man, who irrigates it and takes care of it, tamed or domesticated as tamed animals receive cares from their master (also referred to by means of τιθασός)<sup>32</sup>. The opposite to τιθασός is of course ἄγριος, cf. Plat., *Plt.* 264a.

From this discussion we infer that the interpretation of *TI* and *A* as opposite qualifications of two kinds of OLIV, as advanced by Dr. Chadwick, is extremely tempting, provided that the main objection put forward by the author himself be overcome. The review of the evidence strengthens an opposition of the two kinds of OLIV as fruits from wild olives vs. fruits from domesticated plants. We must now turn to a justification for the existence of these two kinds of olives and especially for the use of fruits from both varieties in Crete during the II Millennium B.C.

9. The cultivated olive tree, *Olea europaea* L., derives probably from the wild plant *Olea chrysophylla* Lam., which is highly polymorphic, through the wild olive, *Olea oleaster* L. or *Olea europaea* var. *oleaster* (or var. *sylvestris* Brot. — subsp. *oleaster* Hoff & Link, Fiori), which is generally admitted to be the ancestor of the Mediterranean domesticated olive<sup>33</sup>. Nevertheless, 'wild olive' is an easy label, since it embraces a great number of varieties as many as the cultivated one (in the Spanish nomenclature: *real*, *morcal*, *manzanillo*, *tachuno*, etc.)<sup>34</sup>

Although olive stones stand up to inhumation well, findings of these are not numerous up to date. J. Renfrew has recently col-

<sup>32</sup> Cf. P. Chantraine, *Dictionnaire étymologique de la langue grecque* [hereafter *Dictionnaire*], Paris 1965, s.u.: «Τιθασός signifie originellement 'apprivoisé', cfr. Ath. 331e, οὕτω τιθασοῦς ὡς ἐκ τῶ χειρῶν δέχεσθαι... ἄρτους».

<sup>33</sup> J. M. Renfrew, *Palaeoethnobotany*, New York 1973, pp. 131-134; for a general survey cf. C. F. Crispo, *La coltivazione dell' olivo presso gli antichi*, Roma 1940, and especially J. Boardman, «The Olive in the Mediterranean: its Culture and Use», *The Early History of Agriculture*, edd. J. Hutchinson et alii, Oxford 1977, pp. 187-196.

<sup>34</sup> E. Aramburu, *El olivo, el aceite y los jabones*, Madrid 1942, pp. 6-10. As to technical points see J. M.<sup>a</sup> de Soroa, *Elayotecnia*<sup>5</sup>, Madrid 1969, and L. Patac de las Traviesas et alii, *Tratado de Olivicultura*, Sindicato nacional del olivo, Madrid 1954.

lected them up to 1972<sup>35</sup>. The evidence relating to stone measures is given below:

TABLE II

| Findspot                                      | Date     | Length (in mm.) | Thickness (in mm.) |
|---|----------|-----------------|--------------------|
| Turkey (Buschan, poss. <i>Olea Oleaster</i> ) | —        | 8.0/10.4        | 4.8/6.4            |
| Myrtos (Warren), Crete                        | EM       | 12.6            | 5.8                |
| Iolkos  | LH       | 11.5            | 5.0/6.0            |
| Salamis                                       | Iron Age | 11.1            | 6.1                |

Recently, P. Åström and H. Hjelmqvist<sup>36</sup> have published some palaeobotanical impressions from Cyprus and Crete, among which there is an olive stone from Knossos (Royal Road N) obtained from a handleless cup dating back to LM I B (beginnings of the 15th century B.C.), i.e. comparatively close to the date of the Knossos tablets. This olive stone measures ca. 10 mm. length, and 6 mm. thick.

The examination of the stone impression leads Hjelmqvist to think that it corresponds to a fruit either from wild olive or from an early cultivated plant. It is to be pointed out that E. Neuweiler<sup>37</sup> has described stones from Crete of Minoan date, which show a length of 6.6/7.2 mm. and a thickness ranging from 4.8 to 5.3 mm. Since the Knossos stone at issue is somewhat greater than these, it is possible that, as Hjelmqvist himself assumes, it comes from an early cultivated kind still near to the wild plant. It must be stressed that Neuweiler reports actually two different kinds of olive stones from Minoan sites: one of them from Sklavokampos recalls the impression from Knossos; the other kind is smaller and its measures have been produced in Table II above. Neuweiler considers them as from wild olive and from an early stage of cultivation<sup>38</sup>.

To sum up, such a pairing of fruit and plants (wild and early cultivated olives) fits well in the couple of ligatured OLIV ideograms. But, on the other hand, a wild olive does not imply at all the absence of any form of cultivation, while keeping its 'wild'

<sup>35</sup> *Op. cit.*, p. 133.

<sup>36</sup> «Grain Impressions from Cyprus and Crete», *Opuscula Atheniensia* 10:2, 1973, pp. 9-14.

<sup>37</sup> «Nachträge urgeschichtlicher Pflanzen», *Vierteljahrschr. Naturf. Ges. Zürich* 80, 1935, p. 98.

<sup>38</sup> *Ibidem*.

status. For instance, consider the case of the Andújar area in Spain, where wild olives are widely 'cultivated', or in Castile, north and west of Spain, where a variety 'cornicabra' or 'corneta' of the olive tree is cultivated, such a kind being actually a 'cultivated' wild olive<sup>39</sup>.

As a conclusion we infer from the palaeoethnobotanical evidence that there were at least *two kinds* of olives in Crete during Minoan and Mycenaean times, and that there is then certain material support for the interpretation of the ligatures +A and +TI as standing for *two kinds* of OLIV. Moreover, it is likely that one of these kinds of olives was wild, and the other an early cultivated plant, a fact that would strengthen the proposal advanced by Dr. Chadwick of A standing for ἄγριος 'wild' and of TI doing for τιθασός 'domesticated'.

At this point, a justification of the Mycenaean preference for 'wild' A olives, as can be easily seen in the tablets, is needed.

10. Some years ago, we wrote apropos of the Knossos olive records: «Una explicación posible para estos asientos de aceitunas coetáneos a los de trigo pudiera ser la siguiente: por Teofrasto (*de od.* 4.15) sabemos que el aceite empleado en la fabricación de perfumes provenía de aceitunas, cuya característica más importante era la ausencia de grandes cantidades de grasa. La obtención de aceitunas de bajo rendimiento graso es posible eligiendo las *malas* (*loc. cit.* ἐπεὶ καὶ τῷ ἐκ τῶν ἐλαιῶν μάλιστα χρῶνται τῷ ὠμοτριβεῖ τῆς φαυλίας, δοκεῖ γὰρ ἀλιπέστατον ἔχειν καὶ λεπτότατον... ἔλαιον μὲν οὖν τὸ τοιοῦτον οἰκειότατον, ἀλιπέστατον γὰρ). La posibilidad de interpretar la 'mediocridad' de la aceituna elegida es doble por cuanto puede tratarse de un tipo de aceituna degenerada o de una aceituna corriente pero recolectada antes de llegar a su punto óptimo (es decir, que es 'mala' para consumo o prensado)»<sup>40</sup>.

As a matter of fact, Dioscorides (I.30) refers to the different quality of those oils intended for medical ointments and perfumes, and points out the peculiar excellence of oil from olives

<sup>39</sup> E. Aramburu, *op. cit.*, pp 7-8, and 10.

<sup>40</sup> J. L. Melena, «Reflexiones sobre los meses del calendario micénico de Cnoso y sobre la fecha de la caída del Palacio», *Emerita* 42, 1974, p. 101 and note 1.

not yet ripe, and, in a second place, that of oil from wild olives, which is more suitable for being squeezed out: ἔλαιον πρὸς τὴν ἐν ὑγείᾳ χρῆσιν ἄριστον τὸ ὠμοτριβές, ὃ καὶ ὀμφάκινον καλοῦσι... χρήσιμον δὲ τὸ τοιοῦτον καὶ εἰς τὴν τῶν μύρων κατασκευήν. [...] τὸ δὲ ἐκ τῆς ἀγρίας ἐλαίας ἔλαιον στυπτικώτερον...

In both cases, it is obvious that the excellence and suitability of the fruit pressed for oil is in inverse proportion to the amount of grease stored in its cells. And the Mycenaeans needed oil more for industrial purposes than for cooking, for evidence from tablets show clearly that such an industrial purpose was the making of aromatic oils and/or unguents (see §§ 17-18). If so, it is easily grasped that they showed a special interest in gathering fruits with a low grease index, and thus the preponderance of records concerning wild olives (OLIV + A) is easily explained. On the other hand, we do not know at all the degree of cultivation concealed under the Mycenaean label *TI* (τιθασός): this kind of olive might have been intended either for the same purpose (as an early stage of cultivation or as being collected when not yet ripe?) or for other purposes such as staple, for instance (see § 19)<sup>41</sup>.

11. We must keep in mind this special interest of Mycenaeans in (wild) olives, which are the main source of raw material for making perfumes —along with the aromatic and styptic plants, whose growing and production were carefully assessed and controlled by the Palace. It seems quite justified that a similar control of the olive production is to be assumed, although the scanty evidence allow us merely a shallow insight of it. Palace control means at first an exact knowledge of the number of olive trees concerned, but unfortunately we have only scraps of documents containing joint surveys of olive groves along with other kinds of trees.

It is known that there are three tablets from Knossos, classified now as Gv, listing figures of a series of trees recorded by means of a pictorial ideogram conventionally transcribed as ARB. This ideogram ARB is somewhat peculiar, since its drawing varies from one entry to other, such a variation being perhaps significant. Unfortunately, these tablets are still obscure, due both to their fragmentary state and to the impermeability of the words involved.

<sup>41</sup> Cf. R. J. Forbes, *op. cit.*, p. 26.

As an illustration we produce below tablet KN Gv 862:

- .1 ]su-za ARB 1770  
 .2 ]jō ARB 405  
 .3 'i-po-qa' ARB 10[ ]ARB 17 \*174 20  
 .4 ] || 4]  
 .5 ] 365 \*174 225  
 .6 ] uacat

It deals with a tree survey concerning a certain spot, whose place-name was probably written at left and is now lacking (cf. *qara* on Gv 863.1): the survey included figtrees (line 1, *su-za* /sut-sai/ < /sukyai/) and possibly vines as well (lines 3 and 5, \*174 stands probably for *we-je-we*<sup>42</sup>, the Mycenaean name for vines, cf. Gv 863.2); it included also some other kinds of trees (lines 2, 3, and 5). It has been noted<sup>43</sup> that ideogram ARB on line 2 represents pictorially an olive tree, and the same might be true of those ideograms on line 3 (if '*i-po-qa*' is to be read '*po-qa*', it would imply that those trees recorded were actually olives, see § 24).

It is not risky to assume that the Palace controlled therefore, as Classical Athens later, the number and location of the olive trees, as did with its figtrees and vines. Nevertheless, these cadastral surveys, which enabled the Palace to assess crops, are almost all missing. As to the olives, there is a close parallel from Third Millennium B.C. Ebla; TM 75.G. 1767 lists also olive trees (*giš-i-giš*) assigned to individuals and located in a place of the Eblaite realm (Answering to each number of trees there is a recording of the surface (perhaps in *iku*) of cultivated field (*gāna-kešda-ki*), but such a correspondence probably does not conceal a ratio of olive trees per Ha., since it would imply a ratio of 1 tree: ca. 8/4 Ha., which is unlikely).

<sup>42</sup> Probably /ueiēwes/, cf. Hesych. οἴην· τὴν ἄμπελον (Georgiev). The ideogram \*174 encloses possibly a ligature *WE* which stands acrophonically for *we-je-we*. On \*174 and *we-je-we* see now St. Hiller, «Fruchtbaumkulturen auf Kreta und in Pylos», *Res Mycenaeeae*, pp. 173 f., and my comments on p. 201. I am completing a paper on «Mycenaean vines and wines», which will be included in a next issue of *Minos*.

<sup>43</sup> *Documents*, p. 272: «On this basis, the four ideograms of Gv 862, lines 2 and 3, would show olive trees of progressively lessening maturity, rather than a number of different species of fruit trees...».

There are no hints on the Knossos tablets about the location of olive groves in Crete. We have only some tablets listing what might be totals from olive harvesting at certain places. Thus on F(2) 852 + 8071 the crop from *da-wo* is recorded; on F(2) 841 + 867 the harvesting done by *mi-sa-ra-jo sa-pi-ti-ne-we-jo* is to be located at Phaistos (*pa-i-to*)<sup>44</sup>. Both places are situated in the Mesara Plain, which represents today one of the main areas of olive growing in Crete<sup>45</sup>.

It would be interesting to know the number of olive trees controlled by the Palace, since we have only the exact figures appearing on Gv 862. Nevertheless, there is a way to calculate the number of trees located at certain places, whose olive crop is extant. In doing this, it is necessary to handle a series of general (1 Kg. olives yields 0.17 l. oil; 1 l. oil weighs 0.9 Kg.; 1 l. olives weighs 0.60 Kg.<sup>46</sup>) or particular (in Crete one olive tree yields approximately 2.5 Kg. oil as a means<sup>47</sup>) equivalencies.

<sup>44</sup> The possessive adjective *sa-pi-ti-ne-we-jo* points to the adscription of *mi-sa-ra-jo* to a 'collector's house (an 'owner' named *sa-pi-ti-nu-wo*, cf. KN As 1516.15, where this name occurs as a member of the team —*qa-si-re-wi-ja*— in charge of *a-nu-to*, to be probably located at Phaistos).

<sup>45</sup> *Geographical Handbook*, Series 516, Greece, H. The Mesará Depression, pp. 237-238. Olive crops might be used as a criterion in locating Mycenaean place-names in Crete. The main olive growing areas are today located near Ierapetra and Khania. Other important spots are scattered on the northern coastal zone (Kastelli-Kisamos, Kastelli-Pedhiadhos, east of Rethymnon, and Siteia). Great olive groves spread also at Palaiokhora and in the Mesara; cf. L. G. Allbaugh, *Crete. A Case Study of an Underdeveloped Area*, Princeton 1953, p. 280. There are no soil requirements for olive, this plant growing equally on good soils, on soils not suitable for other cultivation than carobs and covered by 'macchie', and on sheep and goat pastures (Allbaugh, *op. cit.*, p. 17).

<sup>46</sup> J. M.<sup>a</sup> de Soroa, *Prontuario del agricultor y del ganadero*, Madrid 1947, p. 676.

<sup>47</sup> L. G. Allbaugh, *op. cit.*, p. 269; contrarily J. M.<sup>a</sup> de Soroa, *op. cit.* in note 34, p. 28, points out that in the 1947-1952 campaigns a Greek tree yielded as a means 9 Kg. of olives (i.e. about 1.53 l. / 1.37 Kg. of oil). Nevertheless this apparent imbalance between data from both authors finds an easy explanation. Olive production is the main income in Cretan agriculture and Allbaugh (*op. cit.*, p. 17) has emphasized that yielding per tree was greater in Crete than the remain of Greece, or than Italy or Turkey. This greater yielding per tree was adscribed to a more frequent pruning in Crete than in Mainland. Most of the farmers surveyed (80 %, *op. cit.*, p. 271) endorse that olive trees are to be pruned one time or more every five years. This frequent pruning is possibly to be traced back to Minoan times, since archaeological records highlight intense olive pruning in Minoan sites; see below note 104.



The calculations are tabulated below:

TABLE III

| Tablet  | Place-name                     | OLIV   | OLIVES |        | OIL   | TREES |
|---------|--------------------------------|--------|--------|--------|-------|-------|
|         |                                |        | (lts.) | (Kgs.) |       |       |
| F 852   | <i>da-wo</i>                   | 90     | 8,100  | 4,860  | 826.2 | 330   |
| F 157   | <i>e-ko-so</i>                 | 82 T 4 | 7,389  | 4,433  | 753   | 300   |
| 7 841   | <i>pa-i-to (mi-sa-ra-jo)</i>   | 46     | 4,140  | 2,484  | 422   | 170   |
| E 670.1 | <i>da-<sup>*</sup>83-ja-i</i>  | 89     | 8,010  | 4,806  | 817   | 326   |
| E 669.1 | <i>]ti-jo</i>                  | 88     | —      | —      | —     | 325   |
| .2      | <i>da-<sup>*</sup>22-ti-jo</i> | 45     | ½      | —      | —     | 165   |

As we can see, the figures of trees at different places obtained are of the same order as those appearing on Gv tablets. Nevertheless, it is by no means sure that those OLIV amounts on the tablets represented *real* crops, and not some kind of fiscal *exaction* on real harvests<sup>48</sup>.

While operating with the above equivalencies, we might calculate the total number of trees inferred from the total amount of OLIV entries extant on the tablets. The summing up of all the figures extant reaches a total of 902.9 greater units of OLIV corresponding approximately with 81,261 l. of olives, from which *ca.* 8,288 l. of oil might be pressed out. To take an account of such a total of olives, it is necessary to assume the existence under control of at least 3,315 trees.

We can proceed in the same way starting now with a consideration of the totalling tablets of oil contributions (*a-pu-do-si*) to the Palace:

Fh 366[ + ?] 5503 to-so/a-pu-do[-si] OLE 339 v 5 (equivalent to 10,171.66 l.).

Fh 367 + 5460 to-so-ku-su-pa OLE 330 s[ (equivalent to 9,900 l.)

These totalling oil amounts imply at least the produce of *ca.* 4,000 trees on Fh 366, and *ca.* 3,960 trees in Fh 367 + 5460. That both documents refer to one and the same amount of oil, is not to be excluded. Anyway, it is perhaps significant that tree figures obtained from Fh totalling tablets is of a similar order as those obtained summing up the OLIV quantities still extant. In other words, the oil production contributed on the Fh documents fits in with the total of olive amounts recorded on the Knossos F and E tablets.

<sup>48</sup> Cf. J. L. Melena, *op. cit.*, in note 40, pp. 100-101.

It remains to be pointed out that such a number of olive plants represents only a little part of the total olives in Crete, possibly that corresponding with those areas nearer to the Palace and/or of easier control. As a comparison, we could produce the figures collected by Allbaugh who puts forward about 13,000 million olive trees growing in Crete in the fifties.

Another question is that concerning the area those 4,000 trees might represent in field. It seems necessary to state first the plantation density of olive trees in Crete during Mycenaean times, which we fear will be unattainable. Nevertheless, ancient evidence points to a mean of 80-100 plants per Ha. Modern evidence concerning Crete supports a mean of 15-18 plants per *stremma*, i.e. about 150 plants per Ha. We might assume then that these 4,000 olives on the tablets could have occupied a surface of 40/50 Ha.

12. At present, we do not know whether the oil *a-pu-do-si* contributed to the Palace corresponded to a previous delivery of olives from the Palace itself to various places and/or individuals scattered on Crete, and also whether that oil was actually either the raw produce of the pressing or some kind of oil already processed, i.e. a perfumed oil. Those place-names appearing on the Fh *a-pu-do-si* tablets might refer to the location for olive mills, but also for perfumers<sup>49</sup>.

13. It has been pointed out that oil was obtained by means of a process still at work in Crete in the thirties<sup>50</sup>. First, the fruits were put in hot water and then ground in order to crush olive pulp up to mechanically break the cells where oil is stored. Oil is thus liberated and crushed olives were put subsequently into special vessels to allow the water (along with the water from the olives themselves) to occupy the bottom of the vessel, and the oil to float in the surface. The water was then emptied through a hole in the bottom of vessel, and oil was poured into great *pithoi* for storage. These special wessels—*lekanai*— have been recovered from excavations and their functionality was immediately recognized by Cretan workers<sup>51</sup>.

<sup>49</sup> It has been noted that Fh people are too many to be perfumers. Nevertheless, both olives and oil amounts and figures concerning stirrup-jars strenghten the importance of Perfume Industry controlled by the Palace.

<sup>50</sup> K. F. Vickery, *Food in Early Greece*, Illinois 1936, p. 52.

<sup>51</sup> See K. Branigan, *The Foundations of Palatial Crete*, London 1970, p. 71 and fig. 156 (*lakarnes*).

It is obvious that in grinding and pressing some kind of press was at work. Pressing is achieved by means of treading out, but, in the case of olives, such a process is hardly effective and requires previous grinding<sup>52</sup>. It has been advanced that the Aegean world used a beam press, which was possibly employed to extract oil from olives in II Millenium Thera<sup>53</sup>. A MM press and olive mill were found at Palaekastros, Crete, but detailed reconstruction of the former seems impossible<sup>54</sup>.

In his detailed study on the oil tablets from Knossos<sup>55</sup>, L. Godart has advanced a proposal for the interpretation of the alternant word *to-ro-qa/to-qa*, appearing along with ideogram OLE (see § 14), as /tṛk<sup>w</sup>ā/ 'press', cf. Greek τροπήιον, ἐλαιοτροπικός, ἐλαιοτρόπιον. In spite of the fact that at first sight such an interpretation is tempting, it raises unsurmountable objections. First, the linking of the alleged /tṛk<sup>w</sup>ā/ with the above Greek words seems impossible, provided that these forms (and the cognate verb τραπέω) are to be traced back to a root \*trep- 'to put the feet down', where a labiovelar stop does not occur at all<sup>56</sup>. It follows that 'treading' as a process of extracting Mycenaean olive oil is to be ruled out. If *to-ro-qa/to-qa* represents actually the Mycenaean word for 'press', its relationship with στρέφω, στροφαλίξω, cf. Lat. *torqueo* 'I twist', is likely. Such an interpretation might throw also some light on the word *to-ro-qa* as a description of LANA, Od 563.1<sup>57</sup>. If we are not wrong, it is to be assumed that the Mycenaean press was based rather on twisting as a mechanical device, as much as their contemporary Egyptians, who had discovered that it is possible to exert a greater pressure by means of twisting than by weight<sup>58</sup>. Nevertheless, on the evidence

<sup>52</sup> R. J. Forbes, *op. cit.*, p. 138.

<sup>53</sup> *Op. cit.*, p. 140; and Renaudin, «Vases préhelléniques de Thera», *BCH*, 1922, pp. 113-119.

<sup>54</sup> *ABSA* 8, 1901, p. 308; cf. Sir A. Evans, *The Palace of Minos* I, p. 378.

<sup>55</sup> «La série Fh de Cnossos», *SMEA* 8, 1969, pp. 39-65; and «Les quantités d'huile de la série Fh de Cnossos», *Atti Roma*, 1968, p. 605.

<sup>56</sup> Cf. P. Chantraine, *Dictionnaire*, s.u.

<sup>57</sup> Cf. M. Lejeune, «Les sifflantes fortes du mycénien», *Mémoires* II, p. 110 and note 76: «pourrait ici se référer soit au filage de la laine, soit à l'enroulement de la laine filée».

<sup>58</sup> R. J. Forbes, *op. cit.*, pp. 139 and 115-116, and H. Hodges, *Technology in the Ancient World*, Penguin 1970, p. 101: drawing and reconstruction of such a bag-press.

available, we can hardly admit the existence of an Aegean bag-press, and we must look for another explanation for the word *to-ro-qa/to-qa* (see § 15).

L. Godart is also credited with the elucidation of the oil word *zo-a* as /dzoā/ 'oil from second pressing', cf. ζόη· τὸ ἐπάνω τοῦ μέλιτος, Hesych.<sup>59</sup>. As stated below, we shall not endorse such an interpretation (see § 15).

14. Once obtained, oil was stored and/or disbursed, and consequently recorded on the tablets. The Mycenaean name for oil is spelt as *e-ra<sub>3</sub>-wo*, cf. PY Fr 1184: *ko-ka-ro a-pe-do-ke e-ra<sub>3</sub>-wo to-so e-u-me-de-i* 'So much oil K. contributed to E.'<sup>60</sup>; it represents /elaiwon/ which is close to alphabetical Greek ἔλαιον<sup>61</sup>. Nevertheless, oil entries are generally recorded by means of ideogram \*130, conventionally transcribed as OLE<sup>62</sup>. We do not know what such an ideogram represented pictorially, and when; Linear B drawing shows that scribes dealt with \*130 conventionally, although it sometimes bears a supernumerary loop which might be viewed as a ligature of syllabogram *WE*. E. L. Bennett has suggested that this *WE* stands acrophonically for *we-ja-re-pe* (see also below)<sup>63</sup>.

The examination of tablets concerned enables us to discern distinct oil descriptions or qualifications, either as ligatures with ideogram OLE or as descriptive words accompanying this ideogram. That there were various kinds of olive oil is not strange at all, since this is a well known practice<sup>64</sup>. The difficulties lie in interpreting rightly the Mycenaean oil distinctions.

<sup>59</sup> *Loc. cit.* in note 55.

<sup>60</sup> See e.g. E. L. Bennett, *The Olive Oil Tablets of Pylos*, Suppl. 2 to *Minos*, Salamanca 1958 [hereafter *Oil Tablets*], pp. 40-41.

<sup>61</sup> The Greek name for olive /elaiwon/ is a loan borrowed from a Mediterranean tongue. Although the phytonym is probably Minoan, it has not been elicited in Linear A records yet; Linear A olives and oil records are of course well represented, but these commodities are accounted for by means of ideograms.

<sup>62</sup> A detailed study on OLE ideogram in J. Chadwick, «The Olive Oil Tablets of Knossos», *Cambridge Colloquium*, 1965, p. 26; and M. Lejeune, «De quelques idéogrammes mycéniens», *Mémoires* II, pp. 115 ff.

<sup>63</sup> *Oil Tablets*, p. 22.

<sup>64</sup> A comparison of the distinct kinds of olive oil in Antiquity in A. Wittenburg, «Zur Qualität des Olivenöls in der Antike», *ZfPE* 38, 1980, pp. 185-189.

At Knossos there is only one instance of ligatured oil ideogram, OLE + A in F 726.2, perhaps to be kept apart from the Pylos recurrences of OLE + A (see below). Since an ideogram OLIV + A occurs in the Knossos tablets, it is tempting to link both ligatures and infer that OLE + A was intended to stand for oil extracted from wild olives (OLIV + A). If we leave aside then this unique case of ligatured ideogram, oil qualifications were recorded at Knossos by using four descriptive words entirely spelt: *to-ro-qa/to-qa*, *zo-a*, *po-ro-ko-wa*, and *e-pi-ko-wa*. We must confess first that any interpretation concerning these oil descriptions is at present extremely hypothetical, and a model to account for these four terms can not be attained without distortions. Thus, two opposite interpretations for *to-ro-qa/to-qa* have been advanced: /trok<sup>w</sup>hāi/ 'for consumption'<sup>65</sup> vs. /trok<sup>w</sup>ā/ 'oil press'<sup>66</sup>; the same is true with *zo-a*: /dzoā/ 'oil from second pressing'<sup>67</sup> vs. /dzoāi/ 'for boiling'<sup>68</sup>; and again *po-ro-ko-wa* and *e-pi-ko-wa* are explained jointly as 'libations, pourings'<sup>69</sup> vs. 'common perfumed oil' and 'semisolid ointment'<sup>70</sup> respectively.

15. Obviously the Knossos Fh tablets, where the above descriptions appear, are worth a detailed study from an elaiotechnical perspective, although they have been dealt with in several occasions<sup>71</sup>. It seems possible to throw some light on the obscurities they still offer<sup>72</sup>, in analyzing the quantities concerning the distinct oil qualities<sup>73</sup>; thus a clear pattern of disbursement emerges: whereas whatever their actual meaning was, *to-ro-qa* and *zo-a* oil types are associated with great deliveries of oil, the

<sup>65</sup> As τροφῆ, cf. *Documents*<sup>2</sup>, s.u.

<sup>66</sup> Cf. Greek τροπήιον, L. Godart, «La série Fh», pp. 52-56.

<sup>67</sup> Cf. Godart, *op. cit.*, endorsed in *Documents*<sup>2</sup>, s.u.

<sup>68</sup> L. R. Palmer, *Interpretation*, p. 200: ζοῶ, cf. note 74.

<sup>69</sup> L. R. Palmer, *Interpretation*, s.u.

<sup>70</sup> J. Chadwick, *Documents*<sup>2</sup>, s.u.u. *po-ro-ko-wa* and *e-pi-ko-wa*, and cf. p. 477.

<sup>71</sup> In addition to his papers recorded in note 55, cf. L. Godart, «*ku-pi-ri-jo* dans les textes mycéniens», *SMEA* 5, 1968, pp. 68-69, and «Les tablettes Fh 1056, 1057 et 1059», *Bulletin de l'Institut historique de Rome* 40, 1969, pp. 5-7. From a wide perspective cf. E. D. Foster, «An Administrative Department at Knossos Concerned with Perfumery and Offerings», *Minos* 16, 1977, pp. 19-51.

<sup>72</sup> E.g. the obscure *ku-pi-ri-jo*, cf. J. L. Melena, «Coriander on the Knossos Tablets», *Minos* 15, 1976, pp. 136-139.

<sup>73</sup> Cf. L. Godart, «Les quantités d'huile».

remaining two types are clearly minor as regards the quantities concerned and their frequency of occurrence. It follows that *to-ro-qa* and *zo-a* did represent *real* qualities of oil, whereas *e-pi-ko-wa* and *po-ro-ko-wa* were only meant to record *sporadic* descriptions perhaps not of persistence, but of accident.

If so, the couple *to-ro-qa* and *zo-a* are to be explained in the frame of Mycenaean economic organization. Under this light, it is very tempting to interpret *zo-a* as *nomen actionis* of a verb which is well attested in the tablets, for instance in its participle form *ze-so-me-no* PY Un 267 'to be boiled' <sup>74</sup>. Provided that the great bulk of the Cretan olives was collected strictly from wild olives, and that the total oil amount recorded at Knossos is of the same order as the figures calculated from the olive quantities appearing on the KN tablets, the main bulk of the oil quantities recorded was actually from wild olives, and therefore intended for industrial purposes, strictly to serve as a vehicle for perfumes. As we know now, the Mycenaean making of perfumes was a complicated process, one of whose stages consisted in boiling aromatic and squeezing ingredients in oil <sup>75</sup>, this being probably the main step in perfume making, as is easily inferred from PY Un 267 where the participle *ze-so-me-no* occurs. It is obvious therefore that the interpretation of *zo-a* as /dzoāi/ 'for boiling' imposes itself (cf. Greek ζώνη and the Hesychius' gloss ζώνη τὸ ἐπάνω τοῦ μέλιτος, both referring to the scum, froth formed on the surface of *boiling* liquids) <sup>76</sup>. It is likely that this word is in the dative similarly to *to-u-ka* /toukhāi/ 'for finishing' elsewhere <sup>77</sup>.

On the other hand, the exact oil quality referred to by *to-ro-qa* remains almost obscure; it might refer either to those entries

<sup>74</sup> Cf. note 68. In fait such an interpretation appeared already in *Documents*, p. 413 (cf. M. Lejeune, *op. cit.* in note 57, p. 129 note 165), although Godart's view is endorsed by J. Chadwick, *Documents*<sup>2</sup>, p. 593.

<sup>75</sup> Cf. mainly E. D. Foster, *The Manufacture and Trade of Mycenaean Perfumed Oil*, Ann Arbor, Mich., Ph. D. thesis, 1974. A brief survey on aromatic plants can be found in my paper quoted in note 5; see further Hara S. Georgiu, «Aromatics in Antiquity and Minoan Crete: A Review and Reassessment», *Kretikā Khronikā* 25:2, 1974, pp. 441-456.

<sup>76</sup> Cf. P. Chantraine, *Dictionnaire*, s.u. ζέω.

<sup>77</sup> G. Björk, «Pour le vocabulaire des tablettes 'à bannières' de Knossos», *Eranos* 52, 1954, pp. 273 ff., and recently J. T. Killen, «The Knossos Ld(1) Tablets», *Colloquium Mycenaeanum*, edd. E. Risch and H. Mühlestein, Neuchâtel-Genève 1979, p. 164.

intended for consumption (as /trok<sup>w</sup>hāi/), although the evidence on the Mycenaean use of oil in cooking is improbable, or to other usages<sup>78</sup>.

16. We should now draw attention to the sporadic description *e-pi-ko-wa*. This word occurs twice on the tablets:

Fh 343

du-pu<sub>2</sub>-so / zo-a OLE 15 e-pi-ko-wa OLE 1 s 1 v 3

Fh 380 + 2006 + 5445 + fr.

]jo-te / zo-a OLE 33 s 1 e-pi-ko-wa[

It is a pity that figures concerning *e-pi-ko-wa* entry are lacking on the second tablet; nevertheless, it seems quite justified to take Fh 343 as illustrative, at least as a hypothesis for work. It emerges clearly that there is a striking imbalance between quantities concerning each oil description, *zo-a* and *e-pi-ko-wa*. The pattern of Fh 343 shows that the *e-pi-ko-wa* entry is actually the tenth per cent of the previous *zo-a* entry. Unfortunately, we can not check this inference against Fh 380 + , but there is some additional support to the existence of such oil tithes on the Fh tablets. We shall produce another document bearing a double entry still to be explained:

Fh 361

.a OLE 21 s 2 [

.b ku-pi-ri-jo / o-no zo-a OLE 2[

This document belongs to a number of tablets showing a controversial word *o-no*, standing possibly for some kind of trade device and often associated with *ku-pi-ri-jo*. We wonder whether this double entry might be explained according to the arrangement of Fh 343, in spite of the peculiar recording on Fh 361. It seems clear that figures on .a, OLE 21 s 2 [ correspond to a delivery of oil of *zo-a* quality, for the *zo-a* association with great quantities of oil is well attested. We would suggest that the remaining amount of OLE 2[ corresponds implicitly to an *e-pi-ko-wa* entry. As they stand, the figures on Fh 361 show that the unqualified lower entry is 9.26 per cent of the *zo-a* entry on .a, such an unqualified

<sup>78</sup> For instance in textile processing, cf. *to-ro-qa* along with LANA 'wool' amounts in KN Od 563.1; and cf. § 19.

entry having been recorded as an afterthought below the main entry. Since the tablet at issue is not complet, it is likely that the missing right part bore ]v 3 (and perhaps '*e-pi-ko-wa*' as well) on .*b*, thus completing exactly the tenth per cent of the total of *zo-a* oil recorded (OLE 21 s 2[).

What we suggest is that the amount of any *e-pi-ko-wa* entry was determined by the amount of the *zo-a* entry at issue. These *e-pi-ko-wa* entries were actually tithes not to be exacted, but to be added sometimes to the main entry of *zo-a* oil. They represent some kind of bonuses to cover possible diminishing in boiling oil<sup>79</sup>. Therefore, the interpretation of *e-pi-ko-wa* as /epikhowā/ 'additional liquid allowance' fits well in the context and keeps linguistic requirements, cf. ἐπιβολή 'additional quantity' IG 2<sup>2</sup>. 1672.285, 297 (LSJ); ἐπίδοχή 'reception in addition' Thuc. 6.17 (LSJ). Our proposal rules out therefore a special kind of oil and recovers a bureaucratic word of the jargon of the Perfume Department at Knossos.

In spite of the scanty evidence, we wonder whether the other word, *po-ro-ko-wa*, is susceptible of a similar interpretation as well. Does it mean an 'alternative pouring (i.e., an oil delivery standing in the place of some other commodity)' or 'liquid allowance advanced' (cf. προβολή 'advance' LSJ)?

17. We turn now to the Pylos oil tablets (Fr). On Fr records several ligatured OLE ideograms occur along with or without other descriptive words:

TABLE IV

|  |  |
|--|--|
| <i>Ligatured ideograms</i> <sup>80</sup> | a) OLE + A OLE + WE<br>b) OLE + PA OLE + SI<br>c) <i>po</i> OLE                              |
| <i>oil descriptions</i>                  | a) <i>a-ro-pa we-ja-re-pe</i><br>b) <i>wo-do-we ku-pa-ro-we pa-ko-we e-ti-we(/a-e-ti-to)</i> |

<sup>79</sup> I feel this question is to be left open, since any interpretation of these 'extra' allowance is possible.

<sup>80</sup> Ligatured OLE ideograms are well represented in Linear A tablets (cf. e.g. HT 2, 12, 14, 21, 50, 58), and they might be tentatively transcribed as OLE + U, + A, + E, + MI, + DI, + RA, + KI, + PA/<sup>m</sup>(?), see note 98.



To begin with oil descriptions, they fall into two clear-cut groups: that of the adjectives in *-went(-)* (along with the possible negative *a-e-ti-to*), and that formed by the couple *a-ro-pa* and *we-ja-re-pe*, both built on the same root (\*aleiph- / aloiph-, e-, o-grades of \*aliph-). The latter group has abbreviated accounting items by means of a pair of ligatured ideograms (OLE + A and OLE + WE, standing acrophonically for *a-ro-pa* oil<sup>81</sup> and *we-ja-re-pe* oil respectively), whereas the former group, that of adjectives in *-went(-)*, is possibly not represented at an ideogrammatic level, provided that OLE + PA has nothing to do with *pa-ko-we*, a view which clashes with the *communis opinio* among Mycenologists.

It is clear that both *a-ro-pa* and *we-ja-re-pe* refer to the state of the oil recorded, in this case to its soft quality, i.e. to unguent, either as an adjective applied to oil /X-aleiphes/<sup>82</sup> or perhaps as the dative of the *nomen actionis* /aloiphāi/ 'for ointing', since the Mycenaean name for 'unguent' seems to be a neuter /aleiphar/, cf. the conflated AREPA<sup>83</sup>.

With the evidence available, we fear that a suitable interpretation of the adjunct *po* is almost unattainable. J. Chadwick<sup>84</sup> proposed that *PO* was possibly an abbreviation for the Knossian description *po-ro-ko-wa*, which seems unlikely. More attractive is a suggestion by E. D. Foster<sup>85</sup>, who links acrophonically *po* with *po-ni-ki-jo*, a colouring matter used in dyeing unguents. Nevertheless, no interpretation imposes itself, and there are indeed some other possibilities for the elucidation of the adjunct *po*<sup>86</sup>. Since there were 'Temple' perfumers at Pylos, cf. PY Un 249.1, *Pi-ra-jo a-re-pa-zo-o po-ti-ni-ja-we-jo*, unguents from this Potnia sphere might be labelled accordingly (*po* standing for *po-ti-ni-ja-we-jo*); another possibility springs from the scribal practices of

<sup>81</sup> Cf. *Documents*<sup>2</sup>, p. 528, and E. L. Bennett, *Oil Tablets*, p. 16; *contra* L. R. Palmer, *loc. cit.* in note 1.

<sup>82</sup> *Documents*<sup>2</sup>, p. 477: /X-aleiphes/ = /ualeiphes/ 'for smearing on', where /u-/ , spelt as *we-*, represents  $\upsilon$  ~  $\epsilon\pi\acute{\iota}$ ; L. R. Palmer, *Interpretation*, p. 462: /X-aleiphes/ = /we(h)aleiphes/ 'suitable for anointing garments'; F. Bader, *Études de composition nominale en mycénien: Les préfixes melioratifs du grec*, Roma 1969, /X-aleiphes/ = /ualeiphes/ perhaps 'unguent of good quality'.

<sup>83</sup> Cf. E. L. Bennett, *Oil Tablets*, p. 16.

<sup>84</sup> *Documents*<sup>2</sup>, pp. 572 and 477.

<sup>85</sup> «*Po-ni-ki-jo* in the Knossos Tablets Reconsidered», *Minos* 16, 1977, pp. 61-64.

<sup>86</sup> Cf. the interpretation by L. R. Palmer recorded in note 1.

using adjuncts as age indicatives of items involved (cf. *ne za* ‘recent, of the year’ vs. *pa pe* ‘aged, yearling’), for, since liquids or semiliquids are concerned, the antonym of *pa* /palaion/ ‘aged’ would be Greek πρόσφατον ‘recent, fresh’, whose acrophonic abbreviation is expected to be *po* in Mycenaean script.

The group of descriptions in *-went(-)*<sup>87</sup> refers not to the state of oil, but to its distinctive blending of fragrances and styptic substances or softeners: *wo-do-we* /wordowent/ ‘rose-scented’, cf. *Il.* 23.186 ῥοδόεντι... ἐλαίῳ; *pa-ko-we* /sphakowent/ ‘Sage-scented’<sup>88</sup> or better ‘Tree-moss-softened’<sup>89</sup>; *ku-pa-ro-we* /kuparrowent/, ‘Cyperus-scented and/or -softened’; *e-ti-we* /e-ti-went/ ‘E-ti-scented and/or softened’—rather curiously the absence of this ingredient is likewise significant, since *a-e-ti-to* possibly /ahertiton/ ‘Not-Heti-scented or -softened’ occurs once<sup>90</sup>. The precise identification of *e-ti*— remains to be found, and, although it has been advanced that it might refer to quality descriptions<sup>91</sup>, it is likely that *e-ti*— is to be explained as a vegetal ingredient as well. We should emphasize that both *e-ti-we* and *a-e-ti-to* occur along with another description in *-went(-)*, *pa-ko-we* (cf. similarly *ku-pa-ro-we wo-do-we* as a further instance of doubling of *-went(-)*-ingredient), a fact that to my mind

<sup>87</sup> M. Lejeune, «Les adjectifs mycéniens à suffixe *-went-*», *Mémoires* II, 1971, pp. 13-33.

<sup>88</sup> E. L. Bennett, *Oil Tablets*, p. 16.

<sup>89</sup> M. Lejeune, *op. cit.* in note 87, p. 26 note 63, has aligned σφάκος not with ‘sage’, but with a lichen growing on oaks (Pliny, *NH* 24.27) and rocks (cf. Hesychius *s.u.* βρύα). There is scanty evidence for a precise identification of such a lichen, but I am assuming that this lichen has colouring and/or styptic properties. Nevertheless, there are a number of lichens still used in perfume and cosmetic making. Lejeune’s proposal identifies it as Tree-Moss (*Usnea barbata* Fries), a lichen which is aromatic (cf. Pliny, *NH* 12.108... *sed odore praestantes*) and drying, and even might be used as colouring matter, cf. E. M. Bolton, *Lichens for Vegetable Dyeing*, London 1960, p. 42 (orange-yellowish hue), as well. Dioscorides emphasized its styptic properties along with its use in perfume and unguent making: I.21, *s.u.* βρύον: δύναμιν δὲ ἔχει στυπτικὴν, [...] μείγνυται δὲ καὶ μύροις βαλανίνοις καὶ χρίσμασιν διὰ τὸ ἐν αὐτῷ στυπτικόν, καὶ εἰς θυμιαμάτων δὲ καὶ ἀκόπων σκευασίαν ἐστίν, εὐθετον. Mycenaean *pa-ko-we* might then conceal the Greek name for such a lichen, cf. σφάκος, φάσκος, σφάγνος. Contrarily M. Wylock, *SMEA* 11, 1970, p. 120 note 9, writes: «Aromatic lichens are apparently not found in Greece» (!).

<sup>90</sup> M. Lejeune, *ibidem*, p. 26.

<sup>91</sup> M. Gérard, «Mycénien *etiwe/aetito*», *Studia Mycenaea Brno*, 1968, pp. 103-104, emphasized the relationship of *e-ti-we* and *a-e-ti-to* with the Greek verb ἠθέω ‘filter’, as pointed out by H. Householder (*CJ* 54, 1969, p. 379). The couple at issue might then reflect an opposition of different qualities: ‘filtered’ vs. ‘unfiltered’ oil. Cf. recently E. Hamp, «ἠθος, ἔθος, Myc. *e-ti-we*», *ŽA* 32, 1982, pp. 33-34, ‘ordinary’ vs. ‘non-ordinary’ oil.

seems to denote the description of both softener and scent<sup>92</sup>. We would suggest that *e-ti* was a softener or the like<sup>93</sup>.

Nevertheless, there remains much to be done on the ingredients used in Mycenaean perfume industry, cf. PY Un 267, An 616, Un 249<sup>94</sup>. E. D. Foster<sup>95</sup> has greatly contributed to this subject, but there are many obscurities to be clarified, although a detailed treatment of such points falls rather out of our present scope.

18. We shall limit ourselves to discuss the widely admitted interpretation of the ligatured ideogram OLE + PA, since the alleged equivalence to *pa-ko-we* oil is unparalleled elsewhere. In fact, such an interpretation would entail a special status for the *pa-ko-we* oil, for it is the only blend which corresponds with a ligatured ideogram. There are no occurrences at all of \*OLE + WO (standing for *wo-do-we*), \*OLE + KU (doing for *ku-pa-ro-we*)<sup>96</sup>, and \*OLE + E (for *e-ti-we*) yet. This uniqueness of OLE + PA as standing for *pa-ko-we* is rather strange and is easily abandoned, if another interpretation for the ligature can be put forward.

<sup>92</sup> Cf. E. D. Foster, *op. cit.* in note 85, and Dioscorides on cyperus (1.4.2): εἰς τὰ στύματα τῶν μύρων εὐχρηστεῖ.

<sup>93</sup> M. Lejeune, *ibidem*, p. 26 note 62, linked this *e-ti*— with two Hesychius' glosses: ἔρτις· κρημνός and κρημνός· λευκὰς τινας βοτάνας, whose botanical identification remains to be found. J. André, *Notes de lexicographie botanique grecque*, p. 37, collects Latin evidence concerning a plant named *cremnos*, e.g. Pliny, *NH* 25.155 *cremnos agrios gremios tollit oculorum impositus*. It follows that a) a 'cultivated' *cremnos* did exist as opposite to the 'wild' variety, and b) the 'wild' *cremnos* is eye-healer. This meagre evidence favours 'Red-topped Sage', *Salvia horminum* L., the Cretan καυλόχορτο, as a likely candidate, but nevertheless this plant has not white flowers. To my mind the likeliest candidate for this *e-ti*- plant is elder (*Sambucus nigra* L), since it fits with all requirements. Elder has white flowers and presents a 'wild' counterpart, *S. ebulus* L. On the other hand, elder has ophthalmic virtualities (and was used in Mesopotamia in this way) as well. But it is worth quoting that elder (Sumerian <sup>tiq</sup>MAN-DU, Akkadian *suadu*) was used in Mesopotamia for fixing unguents in order to avoid evaporation of essential oils. 'Cultivated' and 'wild' varieties grow in Crete, cf. I. E. Chabáki, *op. cit.* in note 108, pp. 159, 163, 247, 302, 305, and 410, the wild plant being named as 'Cretan' (εἰδουλος ἢ Κρητική). On the other hand, I wonder whether the Greek name for elder (Ἄκτι) recalls that of κρημνός.

<sup>94</sup> Although such ingredients as wine, honey, must and lanoline, appearing on these tablets, are mentioned in authors dealing with perfume making (Theophrastus, Dioscorides), the remaining two, KAPO and \*157, remain still unidentified.

<sup>95</sup> In her Ph. D. thesis mentioned in note 75, and subsequent papers in *Minos*.

<sup>96</sup> Perhaps both ligatures \*OLE + KU and \*OLE + E would not be relevant, since *ku-pa-ro* and *e-ti*— were possibly not scents, but softeners.

Moreover, we should expect that this ligatured OLE + PA would appear in all the instances where the oil concerned was *pa-ko-we*, whereas *pa-ko-we* oil is represented ideographically by a generic OLE + A in Fr 1240 1217 1223.

It seems a better solution to keep OLE + PA apart from *pa-ko-we*. In doing, we wonder now what was meant by writing the ligatured OLE + PA. On PY Un 2.3 an obscure CYP + PA is attested, and we are unaware also what the meaning of such a ligature PA is when applied to cyperus<sup>97</sup>. Are both instances of ligatured PA to be related? That is by no means sure, but it represents a tempting hypothesis for working on. If both CYP + PA and OLE + PA include a common PA, it is likely that such a ligature is only a seeming PA, since the two horizontal strokes might have been intended to convey not a syllabic meaning, but the sexual marker for male. I suggest then that these ideograms at issue are to be transcribed as CYP<sup>m</sup> and OLE<sup>m</sup>, 'male cyperus' and 'male oil' respectively<sup>98</sup>. Such a suggestion needs no justification when applied to a plant<sup>99</sup>, but the very existence of a male liquid seems rather unlikely at first sight<sup>100</sup>. Nevertheless the masculinity of an oil could entail some sort of oil quality, such a description being expected in Mycenaean records and already attested in Mesopotamian documents<sup>101</sup>: hypothetically it could mean somehow 'rough, coarse' as opposite to 'good, refined' oil, which seems unattested. On the other hand, there is 1<sup>st</sup> Millenium Greek evidence on a 'male oil', although it is by no means clear what is intended by using such an adjective<sup>102</sup>. Nevertheless, the passage of Sophocles' *Trachiniae* (1196-1197) might throw some

<sup>97</sup> I remain rather sceptical on the interpretation of CYP + PA as cyperus plus sage, cf. J. L. Melena, «*Ku-pa-ro* en las tablillas de Cnoso», *Emerita* 42, 1974, pp. 322-323. Since the entry concerned is accounted for by means of dry units, it seems clear that tubers are measured.

<sup>98</sup> This sexual marker applied to vegetal items and even to oil is possibly of Minoan origin, since the PA/male strokes are clearly ligatured with Linear A GRA and OLE, cf. HT 32 OLE<sup>m</sup>?

<sup>99</sup> Cf. Theophr., *HP* 3.9.3, 7.4.3; thus e.g. ἄρσην γογγύλις is *Brassica rapa* L. A peasant has told me that wild olive is referred to as *olivo macho* ('male olive tree') in Tenerife.

<sup>100</sup> But cf. *Od.* 5.467 θῆλυς ἔερση, and Theophr., *CP* 2.6.3, ὕδωρ θῆλυς.

<sup>101</sup> E.g. *šaman rúšti* 'higher quality oil'.

<sup>102</sup> Call., *Hymn.* V.29, ἄρσεν... ἔλαιον, cf. E. Fernández-Galiano, *Léxico de los Himnos de Calímaco* I, A-Δ, 1976, p. 87.

light on the meaning of 'male' as applied to oil: πολλὸν δ' ἄρσεν' ἐκτεμόνθ' ὁμοῦ | ἄγριον ἔλαιον. We may see easily that «they were cutting a lot of wild, male olive trees». There is, on the other hand, plenty of evidence on the association of wild plants with their description as 'male'. We conclude then that 'masculinity' implies 'untaming', and a 'male' oil might be an 'untamed' oil, that is to say, an oil pressed from 'untamed' olives. Therefore I suggest that this Pylian OLE<sup>m</sup> is oil extracted from wild olives to be used in perfume making as much as the ligatured OLE + A at Knossos, i.e. the oil extracted from OLIV + A. If OLE<sup>m</sup> represents unguent from wild olives, there is a low index of grease in this product. If so, OLE + SI might be explained as an extra-greasy unguent, provided that SI stands for σίαλον (another sexual marker as in BOS + SI, SUS + SI), i.e. a 'fattened' unguent, possibly obtained by adding fat<sup>103</sup>.

Our interpretation of OLE + PA as OLE<sup>m</sup> standing for oil from wild olives presents a certain similitude with that by L. R. Palmer of OLE + PA, where PA stands acrophonically for φαυλία 'wild'. Nevertheless there is no evidence of an adjective in Mycenaean, although it could fit well in with the context (cf. § 8).

19. Leaving aside the usage in perfume making, olive oil had actually two other industrial uses, perhaps to be rescued from the Mycenaean documents; these are tanning and textile processing.

Textile processing used oil at least in two stages: as a detergent in finishing and fulling, and, as we have already pointed out elsewhere, in the oiling of warp and weft threads, possibly in linen fabrics, in order to ease weaving<sup>104</sup>.

<sup>103</sup> Cf. the alleged pleonasm in Akk. *šaman rûšti ma-ri-tum* 'higher quality oil *ma-ri-tum*', if *ma-ri-tum* has something to do with *mâru* 'greasy'.

<sup>104</sup> J. L. Melena, *Studies on Some Mycenaean Inscriptions from Knossos Dealing with Textiles*, Supplement n° 5 to *Minos*, Salamanca 1975, pp. 92 ff.; and R. J. Forbes, *Studies in Ancient Technology* IV, p. 196. See *Od.* 7.105 ff. We are leaving aside the question concerning olive wood, cf. for a tentative approach C. Milani, «La lavorazione del legno nei testi micenei», *Contributi dell' Istituto de Storia Antica* 1, 1972, pp. 5-46, but olive wood is not included in her discussion. Abundant findings of olive wood in Myrtos are ascribed to intensive pruning, a fact that means intensive cultivation as well, cf. O. Rackham, «The Vegetation of the Myrtos Region», in P. Warren, *Myrtos. An Early Bronze Age Settlement in Crete*, London 1972, p. 295, and cf. also J. D. Evans, *apud* J. Boardman, *op. cit.*, p. 196.

Two Knossos tablets, Fh 5428 and 5435, deal with oil disbursements to people named *wi-ri-ne-we*, this description to be interpreted as nominative plural /wrinēwes/ or dative singular /wrinēwei/, 'tanners' or 'to the tanner' respectively. The extant quantities (OLE 2 s 1) highlight these disbursements were not intended as rations, but as supplies to be used in the industrial activity of the craftsman involved. That oil was actually employed in some kind of tanning, the oil tanning, is clear from a Homeric passage (*Il.* 17.389ff.):

ὥς δ' ὄτ' ἀνήρ ταύροιο βοὸς μέγαλοιο βοείην  
 λαοῖσιν δῶη τανύειν, μεθύουσιν ἀλοιφῇ·  
 δεξάμενοι δ' ἄρα τοί γε διαστάντες τανύουσι  
 κυκλός', ἄφαρ δέ τε ἰκμάς ἔβη, δύνει δέ τ' ἀλοιφῇ  
 πολλῶν ἐλκόντων, τάνυται δέ τε πᾶσα διαπρό.

where an oily process of tanning is described<sup>105</sup>. Although there are several Mycenaean documents dealing with leather working, we have no evidence on their tanning processes and materials. Nevertheless, the above Homeric quotation fits well with the purpose of the oil amounts delivered to tanners in the tablets at issue.

20. In addition to the above industrial uses, oil was employed in Antiquity for several other purposes: as effective soap, as edible grease, and as lighting.

21. Olive oil is an important cleaner<sup>106</sup>. It is obvious that perfumed oil deliveries to individuals, groups and sanctuaries were intended perhaps for a number of purposes, but cleaning was not of course the least important. Cleaning would affect not only people, but also oil could have been employed in the cleaning of the very images of Mycenaean gods and goddesses, as might be

<sup>105</sup> Tanning processes during Mycenaean times are studied in M. J. Segura, *La industria de la piel en la civilización micénica*, M. A. thesis unpublished, Madrid 1977, pp. 12, 34 and 69.

<sup>106</sup> Cf. J. Chadwick, *The Mycenaean World*, p. 122: «But in the absence of soap the ancient world made much use of olive oil for the toilet, and it was a normal practice to anoint the body with oil after exercise».

analogically inferred from similar Mesopotamian documents<sup>107</sup>. On the other hand, oil is the main ingredient of soap. Nevertheless, we have still no evidence on soda in the Mycenaean tablets, but Crete was full of alkali plants, which might produce soap when treated with oil<sup>108</sup>. The importance of the Knossos textile industry requires the existence of detergents and soap to be employed in the final stage of textile processing<sup>109</sup>; the occurrence of an oil amount associated with garments (*we-a<sub>2</sub>-no-i*) in a Mycenae document might be explained not as intended for perfuming them<sup>110</sup>, but for their cleaning.

22. Olive oil is, on the other hand, an excellent fuel for lighting. Vickery recorded at Naxos the finding of remains of olive oil next to two artifacts alleged to be lamps<sup>111</sup>. Lamps are a current find in Cretan excavations since MM. Unfortunately we have no evidence of oil records intended explicitly for lamps, the name itself for lamp remaining unattested in Mycenaean<sup>112</sup>.

<sup>107</sup> Cf. e.g. 3 *qa šaman rûštim a-na pa-ša-aš sa-la-am E-(l)a-li* '3 *qa* of good quality oil for anointing the image of Elali', J. Bottéro, *op. cit.* n. 9, tablet 73, and G. Dossin, «Tablettes de Mari: 1. Le 'bain' des déesses», *Revue d'Assyriologie* 65, 1975, pp. 23-28. L. Baumbach, «Further Thoughts on the Knossos Fp Series», *Colloquium Mycenaeanum*, edd. E. Risch, H. Mühlestein, Neuchâtel-Genève 1979, p. 203, points also the same purpose for those oil deliveries appearing in the Knossos Fp series, and draws attention to Pausanias (XI.41.3, and V.11.10) and Pliny (*NH* 16.79.213), who collect the use of perfumed oils in order to protect the wood of cult images. She emphasizes that the size of these deliveries (from 9.6 to 28.8 l.) represents monthly disbursements to be used in this way. Nevertheless such quantities are greater than those appearing on Babilonian records (from 1 *qa* to 5 sicles, but ½ *qa* equivalent to about ½ l. oil is the most frequent) for similar purposes. We infer then that Fp sendings were intended for other (additional) uses (lighting?).

<sup>108</sup> Cf. M. Levey, «The Early History of Detergent Substances», *Journal of Chemical Education* 31, 1954, pp. 521-524. In Crete soap plant *Saponaria officinalis* L. grows in wet spots, cf. I. E. Chabáki, Φυτά και Βοτάνια της Κρήτης, p. 312, *s.u.* Τσουένι; and a further source of alkali is *Salsola carpatha* L. and *S. aegeaea* L., cf. O. Rackham, *op. cit.*, p. 297. See for parallels H. de Genouillac, «Le blanchissage au savon à l'époque des rois d'Ur», *Revue d'Assyriologie* 7, 1909, pp. 113 f.

<sup>109</sup> This point is developed in the monograph quoted in note 13. Fullers used oil in textile fulling, cf. Athen. XXII, p. 582.

<sup>110</sup> Attested, on the other hand, in the Homeric songs. References are found in F. R. Adrados, «Sobre el aceite perfumado: Esquilo, *Agam.* 96, las tablillas Fr y la ambrosía», *Kadmos* 3, 1965, pp. 122-148.

<sup>111</sup> *Op. cit.*, pp. 51 ff., 18.

<sup>112</sup> The word or ideogram for 'lamp' is not identified up to date yet, although Mycenaean lamps did exist. The alleged 'lamp' ideogram \*228<sup>vas</sup>, cf. *Documents*, p. 332, stands actually for some sort of scoop.

23. Finally, olive oil was used in cooking, although there is no written evidence for this usage of oil. In fact, Fs tablets from Knossos record oil deliveries along with barley, figs, wine, honey and possibly flour sent to several obscure recipients probably belonging to a religious or cultural sphere<sup>113</sup>. We emphasize that the quantities concerned are too small and even too scanty to be rations, as J. Chadwick has already pointed out<sup>114</sup>. The current oil allowance reaches approximately one litre intended to cover an entire month: such an amount is rather small for cooking or lighting, in any case being strikingly lower than the Fp deliveries of perfumed oil. The association of oil with the remaining commodities seems to point to staple, and we are forced to confess ourselves unable to overcome the obscurities shown in this series of tablets.

24. Whatever its purpose was, Mycenaean oil was obviously carried in some kind of container which permitted its easy circulation, counting and control in disbursements and receipts. For storage the Mycenaeans could have used *pithoi* such as those recovered in West Magazines at the Palace of Knossos, which remain unattested in the tablets. Other vessels and containers were employed indeed. A certain kind of vessel, known as 'stirrup-jar' by archaeologists, was intended for perfumed oil; we know its Mycenaean name spelt in the plural as *ka-ra-re-we*, probably /khlārēwes/, cf. *χλαρόν· ἐλαιηρὸς κώθων*<sup>115</sup> Hesych. On PY Fr 1184 a ratio between an oil amount and the required number of jars for its storage seems to be recorded<sup>116</sup>, hence the standard capacity of this type of jar was about 13.7 l. (equivalent to 3 gallons), cf. the Latin *urna* of 13.92 l. being 4 *quartani*.

Besides this stirrup-jar (cf. *ka-ra-re-we* \*210<sup>vas</sup> KN K 778, cf. 700) intended for perfumed oil<sup>117</sup>, we infer the existence at Knossos of another kind of container. As a matter of fact, three tablets present a striking text:

<sup>113</sup> J. Chadwick, *op. cit.* in note 62, pp. 30 ff.

<sup>114</sup> *Ibidem*, p. 32.

<sup>115</sup> F. Householder, review of *The Mycenae Tablets II*, &c., in *CJ* 54, p. 379.

<sup>116</sup> Cf. *Documents*<sup>2</sup>, p. 481.

<sup>117</sup> J. L. Melena, *op. cit.* in note 72, pp. 161 ff. Cf. also J. Boardman, *op. cit.*, p. 189.



Fh 347.1 ma-ro-ne / ku-pi-ri-jo OLE 6 s 2 MU 5  
 371 ]o-se-ko-do / ku-pi-ri-jo OLE 13 s 1 MU 10  
 5452 ]MU 7

As can be easily seen there are two entries on every tablet (an oil amount —and perhaps even a cluster MN plus *ku-pi-ri-jo*, cf. e.g. only Fh 5544 + 7787— is to be supplemented): the one concerning oil, and the other recorded by means of a syllabogram *MU* standing for an unknown commodity<sup>118</sup> or artifact which is counted. L. R. Palmer<sup>119</sup> is credited with the discovery of a fixed ratio between figures concerning both entries (quantities of oil and counted *MU*'s), and that such a relationship might parallel that in PY Fr 1184 between oil amount and the recipients needed for its storage. If so, the capacity of this alleged *MU* container is OLE 1 s 1, an amount which recurs in Fh 348, and multiples of which appear in Fh 380, 5449, 5450 and 5459, a fact that might imply that oil was handled at Knossos by using *MU* containers. On the other hand, the fixed ratio allows us to recover the missing oil amount on Fh 5452 as OLE 9 s 1.

The converted capacity of this *MU* container is 38.39 l. (equivalent to 9 gallons), similar to that of Alexandrian ἐλαιηρὸς μετρητής of 36.47 l., which is to be traced back to Ancient Egypt artabe. It corresponds also with Classical μετρητής and ἀμφορεύς; hence we would suggest that *MU* did represent also some sort of measure. Nevertheless, this *MU* container does not seem to have been an amphora, since Mycenaean amphorae were used for storing honey and were written consequently in the tablets by means of an ideogram (\*209<sup>vas</sup>) and their capacity was possibly different from *MU* container. Thus we are led to consider *MU* as a typical container for oil distinct from amphora, and perhaps made of different material, i.e. amphora of earthenware vs. *MU* of other material. Since this *MU* once full of oil would weigh more than 40 Kg., it is likely that, if it represents a convenient human load,

<sup>118</sup> Cf. A. Sacconi, «La mirra nella preparazione degli unguenti profumati a Cnosso», *Studi in onore di Piero Meriggi*, Pavia 1969, pp. 281-289, who interprets *MU* as standing for /murra/ 'myrrh'; M. Lejeune, «Sur quelques termes du vocabulaire économique mycénien», *Wingspread Colloquium*, 1964, p. 78, thinks of μύρον 'perfume' as represented acrophonically by *MU*.

<sup>119</sup> *On the Knossos Tablets. The Find-Places of the Knossos Tablets*, Oxford 1963, p. 87.

*MU* was a container suitable for adapting to the back of the carrier. We would suggest then that *MU* container represent some kind of oil-skin —possibly made of the whole skin of a goat<sup>120</sup>, to be perhaps related with a word *de-ma-si* preceding an oil delivery in Fh 5432.v.<sup>121</sup> What *MU* stands acrophonically for, is difficult to grasp. *MU* might stand for a hypothetical /mursa/, cf. Greek βύρσα 'wine-skin'<sup>122</sup> (for the alternancy *m/b* in initial cf. μύρσος 'basket' Call. fr. 756 Pfeiffer, and Hesych. *s.u.*), although the syllabogram may conceal also some word not extant in the Greek lexicon. Another possibility in interpreting *MU* is that this syllabogram was identical with ideogram BOS, and that Minoan oil skins were made of ox hides, but their capacities would have been greater than that assumed for *MU*-skins.

25. For the sake of completion, we shall close our survey on the olive oil in Mycenaean tablets with a brief excursus on olives. Although olives were mainly used for obtaining oil, as pointed out, they are themselves an important element of staple. It is to be expected that Mycenaeans used olives as staple and their being recorded along with figs and barley suggest that they were also eaten. Nevertheless, the evidence is imbalanced: too scanty at Knossos (perhaps only in Uc 161) and at Mycenae (Ue 611), but rich on the contrary at Pylos. Fn tablets from Pylos record disbursements of barley, and seldom of figs or olives, to several people<sup>123</sup>. We are not aware whether these staple distributions corresponded with some sort of wages in the frame of a pre-monetary economy or merely represent rations for dependent Palace personnel, either as slaves or as *corvée*-conscripted people<sup>124</sup>.

<sup>120</sup> Cf. *Il.* 3.247; ἄσκη ἐν αἰετῷ. Ancient Egyptians used 'water-goats' and 'wine-goats', obviously 'wine-skins'. Cf. Maspero, *Contes populaires de l'Égypte ancienne*, Paris.

<sup>121</sup> The occurrence of *de-ma-si* /dermasin/ along with OLE seems to point to the above explanation, cf. *Od.* 2.241 δέρμασιν ἐν πικνοῖσιν, where the adjective refers obviously to the peculiar treatment of skins to made them waterproof (in the case of the above Homeric quotation, intended to keep flour apart from moisture). An oil-skin of the required capacity of 38-39 l. is easily imagined.

<sup>122</sup> Without etymology, cf. P. Chantraine, *Dictionnaire*, *s.u.* «(terme technique obscure)».

<sup>123</sup> J. L. Perpillou, «Donnés numériques des documents Fn de Pylos», *SMEA* 17, 1976, pp. 65-78.

<sup>124</sup> This is a subject which deserves attention, cf. J. Chadwick, *The Mycenaean World*, pp. 77, 79.

Finally let us point out that in PY UN 138.2 a mention *po-qa* is aligned with ideogram OLIV, probably being rendered as /phorg<sup>w</sup>ā(i)/ '(for) consumption', cf. φορβή<sup>125</sup>. In Ua 9.1 and Un 138.5 there appear instances of a word *ka-pa* (related with KN F 841 *ka-po e[* /karpoi e[laiwās/ 'olive fruits'?; /karpos/ does exist as well at Pylos, cf. the ligature *KAPO* An 610, Un 249, 267, and 592)<sup>126</sup>. In spite of such meagre evidence, it seems clear that olives were consumed, although this purpose was seldom recorded on the tablets. This does not mean at all that olives were seldom consumed, but the Palace interest was focussed more on their industrial uses than on others.

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<sup>125</sup> Cf. *Documents*<sup>2</sup>, p. 573.

<sup>126</sup> *Documents*<sup>2</sup>, p. 550. On *KAPO*, cf. A. Sacconi, «The Monogram *KAPO* in the Mycenaean Texts», *Kadmos* 11, 1972, pp. 22-26, but her identification is unlikely.