



## Red coloured cloth in the Linear B archives

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# Colour in the Ancient Mediterranean World

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## Section One: The Creation of Colour

### Red Coloured Textiles in the Linear B Inscriptions<sup>1</sup> Marie-Louise Nosch

This paper discusses the terms used in Mycenaean Linear B tablets for red colours of textiles: *po-pu-re-ja*, *e-ru-ta-ra*, *pu-ru-wa* and *po-ni-ki-jo*.<sup>2</sup> It is suggested (using results from experimental archaeology, and studies of ancient dyeing methods, along with the Linear B evidence) that some of these colour-terms also indicate the dye-substance. The Mycenaeans are generally regarded as relying on murex, safflower and madder as sources of red dye, but the Linear B vocabulary and paleobotany provide evidence of other possible dye plants. It will also be suggested that red textiles described with the colour-term *purwai* are perhaps not dyed, but were the natural red-brown colour of Bronze Age sheep.

A fundamental problem with analysing Linear B colour-terms is whether they refer to a colouring technique, or purely to the final result, the colour in itself. A second problem is the Mycenaean scribes' use of the terminology of colour: when the same colour terminology is used for different objects, then it is reasonable to assume that these are the same colour. However, when a scribe has several terms at his disposal for one basic colour group, each term may indicate either various nuances of colour, or various sources for the colours. The colour-term 'purple,' for example, probably did not simply indicate the colour 'purple' (which could also be obtained by means of plant dyes, see Shamir, this volume) but also the quality of murex-dyed cloth, which was precious and colourfast.

The primary written sources for colours in Linear B inscriptions are the textile records. It is not just an accident that our information on dyed textiles comes from the records of wool and woollen cloth: there are few extant records about linen cloth, while the harder nature of flax fibres makes linen much more difficult to dye. It also does not seem coincidental that some textiles (those termed *te-pa*, *tu-na-no* and *te-pa pe-ko-to*) are never described with colour-terms, since these are very large,

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<sup>2</sup> Ideograms for wool and textiles are found in Linear B inscriptions from Knossos in Crete, and Pylos, Mycenae and Thebes on the mainland. The tablets are dated to the Late Bronze Age, but the dyeing of cloth and wool had a long history in Bronze Age Greece (Burke 1999). However, development of dyeing techniques would have been encouraged by the loss of pigments in sheep wool, a process which is dated to the Late Bronze Age – Early Iron Age. (Ryder 1969: Fig. 5)

heavy, textile types, requiring 21, 9 and 30 kilos of raw wool respectively for their fabrication.

However, two other textile types (termed *pa-we-a* and *pu-ka-ta-ri-ja*) are frequently described as possessing colour, or coloured decoration. They are smaller, or at least less heavy, requiring about 5 and 3 kilos of raw wool respectively. One LANA unit of wool equals three kilos. One piece of *pa-we-a* equals 1.67 LANA units, about 5 kilos. Regarding *pu-ka-ta-ri-ja* cloth:

*PU*-garments were by far the most abundant among the Mycenaean textile fabrics, and for their manufacture only a LANA unit of wool was probably needed for each item. Therefore, we are suggesting that *PU*-garments, named *pu-ka-ta-ri-ja/puktaliai* from \*/puktaliai/ 'the folded ones,' might represent some sort of loincloth or kilt (Melena 1987b:445).

However, much evidence suggests that the weight of the finished piece of textile was only about half of the weight of the raw wool (Andersson & Nosch 2003).

One could argue that the fact that only some textile types appear to be recorded with colour-terms is due to the types of administrative documents that have been preserved, the *pa-we-a* and *pu-ka-ta-ri-ja* cloth having been recorded on storage records where information about the colours happened to be important. However, the *te-pa*, *tu-na-no* and *te-pa pe-ko-to* textiles seem to have been of a more basic nature, which could explain the absence of colour descriptions. This article will therefore focus on the two cloth types *pa-we-a* and *pu-ka-ta-ri-ja*, as the only ones recorded with information on colours, and red colours in particular.

#### Storage of dyed *pa-we-a* cloth

What colours would one see when entering a palace storage magazine of textiles? In the storage records, cloth of the type *pa-we-alpharwea* is recorded with the qualification *e-ru-ta-ra-pi* 'with red', *ko-ro-ta<sub>2</sub>* 'decorated with *ko-ro-to*' (Killen 1979:162-3), *pa-ra-ku-ja* 'of *pa-ra-ku* colour' (Bennet *et al.* 1989:205; Melena 1987a: 225-6) or *po-ri-wa* 'grey'. Cloth is often decorated with *o-nu-ke*, edgings, which can either be white, *re-u-ko-nu-ka*, or variegated, *po-ki-ro-nu-ka*. However, not all these colours are equally represented in the Mycenaean storage magazines: in fact, as can be seen from a totalling record of deliveries of *pa-we-a* (Ld[1] 587), most of them are with 'white edgings' *re-u-ko-nu-ka*:

<i>re-u-ko-nu-ka</i>	372 pieces of <i>pa-we-a</i>	= 82.1%
<i>pa-ra-ku-ja</i>	42 pieces of <i>pa-we-a</i>	= 9.3%
<i>po-ki-ro-nu-ka</i>	24 pieces of <i>pa-we-a</i>	= 5.3%
<i>ko-ro-ta<sub>2</sub></i>	14 pieces of <i>pa-we-a</i>	= 3.1%
<i>po-ri-wa</i>	1 piece of <i>pa-wa</i>	= 0.2%

## Section One: The Creation of Colour

In the other records, the *pa-we-a* cloth with white edgings is also dominant,<sup>3</sup> so generally, most *pa-we-a* in the storage records seems to have white edgings. The production from 'collectors' (perhaps a kind of palace agent) seems to be of the same composition as that without 'collectors' – that is, a majority of *pa-we-a* with white edgings (71%-92%) and small quantities of the other cloth types.<sup>4</sup>

Aside from the edgings, how should we imagine the *pa-we-a* cloth? The fact that the edgings are either white or variegated suggests that the textile itself had another colour, presumably the natural colour of the wool, which in the Late Bronze Age might be white or brownish (Ryder 1983:45-9). Some of the *pa-we-a* with white edgings can also be described as *e-ru-ta-ra-pi*, 'with red', and interestingly, when this combination occurs, it is always with *pa-we-a* cloth *ke-se-nu-wi-ja*, 'for the guests' (<*xenos*). *e-ru-ta-ra-pi*, 'with red' occurs on some storage tablets, and seems to be in some way associated with *re-u-ko-nu-ka*, 'white edgings'. The description *e-ru-ta-ra-pi*, 'with red' is not repeated in the totalling record which summarises the individual storage records, nor does it occur in the production targets or delivery records. This suggests that whatever was 'with red' on these *pa-we-a* textiles, it was of minor importance in most contexts, at least compared to the white edgings.

### Red Dyed Cloth and Wool

It is significant that we have several names for the red colour on textiles: *po-pu-re-ja*, *e-ru-ta-ra*, *pu-ru-wa*, and *po-ni-ki-jo*. I would suggest that that these four terms for 'red' are not just colour terms, but can also, in some cases, indicate the substance with which the cloth was dyed. This suggestion is based on the assumption that the type of dye substance used could have indicated the quality and value of the product, and that these must have been of major importance to the palace scribes.

#### 1. *po-pu-re-ja*

With murex one can dye cloth to the colours blue, purple and red. It is generally agreed that the terms for 'purple' *po-pu-re-ja* (in the plural form on L 474) and *po-pu-ro<sub>2</sub>*

(in the dual form on L 758) indicate murex-dyed cloth (Palaima 1991:289-91). A specific type of cloth is murex-dyed: *pu-ka-ta-ri-ja* cloth, of which we have record of 21 pieces on L (7) 474 and of two pieces with angular patterns (*o-re-ne-o*) on L 758:

Knossos L(7) 474 (scribe 211)  
po-pu-re-ja, / pu-ka-ta-ri-ja TELA<sup>3</sup> + PU 21

#### Knossos L 758

.a ]re-ne-o, po-pu-ro<sub>2</sub>  
.b ]o-no TELA<sup>2</sup> + PU 2

.a Probably o-]re-ne-o (cf. L 593.Ab *o-re-ne-a*)

It was suggested above that one piece of *pu-ka-ta-ri-ja* cloth required one LANA unit of raw wool (three kilos) and that a finished piece would then weigh some 1.5 kilos. We can thus hypothesise that the 21 pieces of *pu-ka-ta-ri-ja* cloth would weigh about 31.5 kilos. The quantity of murex snails required for this weight of wool would depend on the desired colour intensity, but experimental archaeology has shown that not much murex dye was necessary to obtain a strong, colourfast, reddish-purple.<sup>5</sup>

Palmer (1963:297) interpreted *po-pu-re-ja* as an occupational designation for female purple dyers, implying a local Cretan purple industry. It is, however, more plausible to interpret *po-pu-re-ja* as an adjective (Ventris & Chadwick 1973:321, 488) in which case the cloth might equally well have been imported: one of the tablets above (L 758) may contain the term *o-no* which is sometimes used in transactions and trade.

Another tablet, X 976, lists something or someone (the ideogram is lost) royal, from or at the place *da-\*83-ja*.<sup>6</sup> The term *po-pu-re-ja* could therefore be an adjective for objects 'of purple colour', a noun for a place 'purple-dyeing workshop' (Palaima 1991:291) as well as an occupational designation for the people involved in dyeing, 'the purple dyers' (Carlier 1984:52).

Knossos X 976 + 8263 (scribe 225)

.1a da-\*83-ja po-pu-re-ja[  
.1b to-so / wa-na-ka-te-ro [  
.2 vacat [

<sup>3</sup> On the individual storage tablets of *pa-we-a* cloth, without mention of 'collectors' (Ld[1] 571-575, 579, 583, 585, 599, 649), there are eight mentions of *pa-we-a re-u-ko-nu-ka*, one of *pa-we-a po-ki-ro-nu-ka*, one of 30 *pa-we-a pa-ra-ku-ja*, and one mention of *pa-we-a ko-ro-ta<sub>2</sub>*. The scribes often record 25 pieces of *pa-we-a* on storage tablets. We can thus restore, hypothetically, 200 *pa-we-a re-u-ko-nu-ka* (71%), 25 *pa-we-a po-ki-ro-nu-ka* (9%), 30 *pa-we-a pa-ra-ku-ja* (11%) and 25 *pa-we-a ko-ro-ta<sub>2</sub>* (9%).

<sup>4</sup> On an individual delivery record of the production of 40 *pa-we-a* (Ld[1] 598), from the 'collector' *wi-jo-qo-ta*, there are 92.5% *pa-we-a re-u-ko-nu-ka*, 2.5% *pa-we-a po-ki-ro-nu-ka*, and 5% are *ko-ro-ta<sub>2</sub>*. On the difference between storage and delivery records in the Ld(1) set, see Killen 1979: 151-2.

<sup>5</sup> Some publications on natural dyes erroneously assume that enormous amounts of snails are needed to dye cloth. This is based on 19th century chemists' calculations of the amount of snails needed to extract one gram of pure alizarin. For the cloth dyeing, many fewer snails are needed. See Lowé, this volume.

<sup>6</sup> This place name occurs also on tablets recording sheep (Dc 1414; Dv 1086), workers' remuneration in grain and olives (E[2] 670), lists of men (V[3] 479, Vc[2] 7517). Oil is sent to *da-\*83-ja* (Fh 365, 9067, Fp[2] 363).

## Section One: The Creation of Colour

Some scholars have suggested that this tablet records royal purple cloth (Killen 2000-1:n.10; Burke 1999:78). This is especially tempting because we have another tablet recording royal cloth (Lc[1] 525). Killen writes that "the adjective [purple] also occurs on KN X 976, in conjunction with the adjective *wa-na-ka-te-ro*, 'royal'; but while the reference here is almost certainly to royal, purple cloth, the precise variety of the latter is not specified." (1979:152). There are, however, some arguments against this interpretation:

1) The tablet above, X 976, records a total of something, and thus we must expect plural forms. Most cloth types are either feminine or neutral (*te-pa*, *pu-ka-ta-ri-ja*, *pa-we-a*) and therefore they have adjectival forms in Linear B ending in *-a*. However, the adjectives on the tablet, *wa-na-ka-te-ro* and *po-pu-re-jo*, end in *-o*. Thus, what is totalled here should be masculine.

2) We know the scribes responsible for the records of the Knossian textile industry quite well, and this tablet is not from their hands.

I agree, however, that in some way the tablet is concerned with royal, purple dyed cloth, but I do not think that the actual cloth is recorded here. I would suggest royal craftsmen engaged in murex dyeing. The adjective 'royal' is in Linear B also used for other craftsmen.

Carlier (1984:52) suggests that the list of men V(6) 832, written in the same hand (scribe 225) is of 'teinturiers de pourpre,' an interpretation that I find very tempting (although I wonder if they could not also have been murex fishers):

Knossos V(6) 832 + 961 + 8666 + fragments(scribe 225)

- |    |                |          |          |   |
|----|----------------|----------|----------|---|
| .1 | vest.[ ]       | vest.[ ] | we       |   |
| .2 | si-ra-pe-te-so | 1        | ka-pu-ro | 1 |
| .3 | ka-na-po-to    | 1        | pi-ma[   |   |
| .4 | ru-ro          | 1        | a[       |   |
| .5 | ta-u-ro        | 1        | [        |   |
| .6 | u-ta-jo        | 1        | [        |   |
| .7 | ja-sa-ro       | 1        |          |   |

There may have been up to eleven men recorded on this tablet. Olivier discusses this tablet and notes the high number of *hapax* among the men's names (Bennet *et al.* 1989:206-7). On a tablet from Ugarit, craftsmen, probably dyers of purple wool, are also recorded by name, and a significant number of their personal names are of Hurrian origin (Thureau-Dangin 1934). I would therefore suggest that tablet X 976 shows that at *da-\*83-ja* men were involved in either purple fishing, purple extraction, purple dyeing, or the manufacture of purple cloth. It is tempting to locate *da-\*83-ja* at the shore, and far from inhabited centres, since purple dyeing is a very foul-smelling craft.

### 2. *e-ru-ta-ra*, *e-ru-to-ro*

*e-ru-ta-ra* and *e-ru-to-ro* (*eruthros*) describe cloth, hides and safflower (*Carthamus tinctoria*).<sup>7</sup> At Knossos, two scribes (116 and 114) use the term *e-ru-ta-ra-pi* to describe some decorative red element on *pa-we-a* cloth, mostly cloth with *re-u-ko-nu-ka*. This could mean that the dyestuff in this case was safflower. It is, however, unlikely that hides recorded as *e-ru-ta-ra* were dyed with safflower. Hides had probably been dyed with madder (*Rubia tinctoria*). *e-ru-ta-ra* looks more like a word which is being used as a general colour-term at Knossos. *e-ru-to-ro* and *e-ru-ta-ra* are definitely colour-terms at Mycenae, where for the safflower (*ka-na-ko*) contributions, the scribe distinguishes between their red parts (the florets) and their white parts (the seeds).

Mycenae Ge 605, 4 A-B (scribe 57/House of Sphinx)

.4A ka-na-ko, e-ru-ta-ra M 2 P 1 ka-na-ko re-u [-ka  
.4B ka-e-se-u / ko-ri-a<sub>2</sub>-da-na T 2 ku-mi-no Z[

The contributions recorded on the Mycenae tablets vary between 1-3 kilos. The Mycenae Ge records are of spices (Killen 1983:216) but safflower florets are not really edible. They could have been used to colour food, but the quantities suggest another use. We have preserved records of payments of some 14 kilos of safflower florets (calculated from two payment records, Ge 603 and 605, see Killen 1983:225), a quantity with which can dye the same weight of cloth. Each safflower plant measures up to one meter, and carries 30-90 florets (Cardon 1990:27-8). If we assume that each plant gives 50 grams of florets, then the individual contributions of 1-3 kilos would have come from 20-60 plants, and the total contribution would have come from around 280 plants. The total may very well have been more, since tablets have been lost. It is therefore very plausible that the Mycenae 'spice' records contain not only spices but also important quantities of dye stuff.

### 3. *pu-ru-wa*

Knossos L 5561 + X 5656

(-/F14)<sup>8</sup>

- |    |         |                            |   |  |
|----|---------|----------------------------|---|--|
| .1 | ]-ru-wa | TELA <sup>3</sup> + PU 980 | [ |  |
| .2 | ]       |                            | [ |  |
|    |         | <i>inf.mut.</i>            |   |  |

<sup>7</sup> *ka-na-ko*, *knekos* See Killen 1983 on the Ge series. An excellent analysis and discussion of *ka-na-ko e-ru-ta-ra* / *re-u-ka* is found in Varias García, forthcoming, whom I thank for providing me with a copy. Duhoux 1993:105.

<sup>8</sup> The find-places for tablets with 5000 numbers have been studied by Firth & Melena, forthcoming. The two fragments are from two different batches: 5561 from batch D with fragments mainly from East-West corridor, 5656 from batch E with fragments also from East-West corridor and from magazine XV found in 1901. Firth & Melena associate both fragments with magazine XV / F14. This is, indeed, the find-place of many of the textile records.

## Section One: The Creation of Colour

.1 Perhaps ?]du-ru-wa but ]pu-ru-wa not excluded, and probably better.

This tablet has recently been published by Melena (1996-7:418). It has long been wondered what was once written in front of the extremely large number of pieces of *pu-ka-ta-ri-ja* cloth. Some have suggested the name of a producer or person responsible for the many pieces of cloth; others, the name of the place where the cloth was produced. However, in a recent publication, Killen has suggested reading *pu-ru-wa* in the first line, and interprets it as *purwai*, a *scriptio plena* of the adjective (in the feminine plural form) meaning 'red' (2000-1). From a contextual view, this interpretation correlates with our existing knowledge of Mycenaean textile production and administration: it is indeed unlikely that one place or one person within the decentralised Knossian textile industry would produce and/or decorate 980 pieces of cloth. Thus the tablet seems more likely to be a totalling record of the storage of all these 980 pieces of red *pu-ka-ta-ri-ja* cloth. Note that again we have the combination of the red colour and the cloth type *pu-ka-ta-ri-ja*.

If one piece of finished *pu-ka-ta-ri-ja* cloth weighed some 1.5 kilos, then 980 pieces would probably equal about 1,470 kilos. This is an enormous quantity of cloth, requiring the wool from around 4,000 sheep. To dye this quantity with safflower or murex would be extremely costly. Alkanet (*Alkanna tinctoria*, *Anchusa tinctoria*) would be a less expensive possibility, demanding some 700 kilos of alkanet roots. However, according to Cardon (1990:29-30) alkanet is not a likely candidate, being soluble only in alcohol, fats, or oil, and not very fast. Roth, Korman and Schweppe, on the other hand, give recipes for dyeing wool with alkanet in water. The remaining option is madder, of which one would need 900 kilos (Cardon 1990:33-7; Roth *et al.* 1992:126). These calculations are based on the need to achieve rich red colours, however, when perhaps weaker shades and less dye would have been acceptable. It must be emphasized, however, that enormous amounts of dyestuff is needed in order to dye this quantity of cloth.

It is my suggestion here that *pu-ru-wa* designated the natural red-brown colour of Bronze Age sheep. White wool was not as common in the Bronze Age as it is today (Ryder, 1969:495-510). *pu-ru-wa* could simply indicate that these many pieces of cloth were of a particular natural wool colour. This interpretation might be strengthened by the fact that several Mycenaean personal names, or nick-names, are formed from the same term: *pu-wa* (KN Ap 639, B[5] 799), *pu-wa-ne* (PY Jn 832), *pu-wi-no* (PY Cn 131; 655), and *pu-wo* (MY Ge 603, KN As[2] 1516, C[4] 912) – possibly referring to the natural colour of skin and hair. In Greek, *purros* is used

for human hair, and for the colours of lions, horses, oxen and goats.<sup>9</sup>

### 4. *po-ni-ki-jo*

The terms *po-ni-ki-ja* /-jo and *mi-to-we-sa* in Linear B describe chariots painted red, recalling two Homeric epithets for ships, *phoinikopareos* and *miltopareos*. These Mycenaean terms seem to be synonyms, at least for scribe 128.<sup>10</sup> While textiles are coloured with dye substances from plants or animals, wood would be coloured with an inorganic pigment. There could have been red leather on the sides of the chariots, in which case both organic and inorganic colouring substances could be used. *po-ni-ki-jo* is also probably indicated by the abbreviation *PO* in the records of scented and red coloured oils (Foster 1977b:64).<sup>11</sup> One tablet may perhaps record wool and *po-ni-ki-jo*, but it is in a very bad state of preservation, and both scribe and find-spot are unknown.

### Knossos Od 5082

.1 'po-]ni-ki-jo' LANA[  
.2 ]vacat ]

.2 Traces at left. Traces at right not incompatible with LANA [.

We also know a Knossian textile craftsman, *e-ta-wo-ne-u*, who works with *po-ni-ki-jo*. He decorates and finishes cloth (Killen 1979:n.17). On two fragmentary tablets, he occurs with links to different aspects of the colouring or dyeing process:

Knossos Ga(2) 1335 (scribe 136)  
.a ?e-ta-]wo-ne-we [  
.b ]po-ni-ki-jo[

Knossos Xe 7711 (scribe 103)  
.a ?ku]pi-ri-jo do-ke [  
.b ] e-ta-wo-ne[

.a Traces at right perhaps not inconsistent with LANA[.

On Ga(2) it seems that *e-ta-wo-ne-u* (in the dative form *e-ta-wo-ne-we*) receives *po-ni-ki-jo*. On Xe 711, someone gives, 'dokei,' something to *e-ta-wo-ne-u* (Shelmerdine 1988:353,364-5; 1995:99-107). The product given is probably wool or textiles, since the tablet was written by the specialist scribe we call 103, who deals with nearly all

<sup>9</sup> I thank John Killen for discussing this term with me.

<sup>10</sup> But Lejeune 1972:304, suggests two different colours, 'vermillion' (orange-red) and 'pourpre' (purple). Scribe 127 (Se series) writes *po-ni-ki-ja* / *po-ni-ke-a*. Scribe 128 (Sd, Sf series) writes *po-ni-ki-ja* as well, but uses the term *mi-to-we-sa* on Sd 4404, 4407, 4415 and 4416.

<sup>11</sup> The abbreviation *PO* inside the textile ideogram on a newly discovered tablet at Thebes could refer to *po-ni-ki-jo*, or to the type of textile. Nosch 2001-2:179-83.

## Section One: The Creation of Colour

aspects of Knossian textile production. The one who gives may be *ku-pi-ri-jo*, 'the Cypriot', a name, or perhaps the title of someone who seems to be involved in trade, and to have a rather high status at Knossos (not unlike the 'collectors'). If one should read *ku-pi-ri-jo* on Xe 7711, and if it is a title, then it does not seem a coincidence that a person with the same title occurring on a tablet from Pylos, is dealing with the mordant alum, and wool (Un 443).

*po-ni-ki-jo* is also the name for a product given as a contribution from various places in central Crete. Scholars generally agree that it is a plant substance, used as a source of red dye (Murray & Warren 1976; Foster 1977b). It is used in the perfume industry (recorded by scribe 136) and probably also in textile production (recorded by scribe 137, see Foster 1977a:48-51). The palace at Knossos procured *po-ni-ki-jo* from Cretan villages, and from the 'collectors'. We have about 100 place-names in the Knossos archives, and only five of them can be pinpointed on the map: Knossos, Phaistos, Kydonia, Amnisos and Tylissos. There are records of deliveries of *po-ni-ki-jo* from ten Cretan places. One of them is Tylissos, but the nine others cannot be located archaeologically.

However, several of the ten villages recorded as delivering *po-ni-ki-jo* are also listed elsewhere as centres of agricultural (Uf series, E 749) and spice production (Ga series). These must therefore have been places with good soil. The place-names preserved on the tablets for deliveries of *po-ni-ki-jo* are: *da-wo* (Ga[2] 427), *ku-ta-to* (Ga[2] 673?), *pu-na-so* (Ga[2] <34>?, 420), *pu-so* (Bg 992), *qa-mo* (Ga[2] 417), *qa-ra* (Ga[2] 423), *su-ri-mo* (Ga[2] 418), *ti-ri-to* (Ga[2] 428, Bg 5584?), Tylissos (Bg 7682), and \*56-ko-we (Ga[2] 424, perhaps Bg 1040, a reading criticised by Olivier in Godart *et al.* 1986:39). In all these places flocks of sheep were also recorded (Olivier 1988).

Further information can perhaps be gained through studying these place-names: these *po-ni-ki-jo* places also correspond with places producing *pu-ka-ta-ri-ja* and other types of cloth (Nosch 1997-2000:35-36, 38) and the cloth type *to-mi-ka* (*qa-ra*, *ra-ja*, *ra-su-to*, *ti-ri-to*, Nosch 1997-2000:36,38). As *pu-ka-ta-ri-ja* cloth is often dyed red, it is possible that it was partly dyed in these villages where the red dye substance was readily available.

The amounts of *po-ni-ki-jo* are quite large: Foster (1977b:55) restores a total collection of about 100 kilos. On the other hand, *po-ni-ki-jo* is collected from the villages, and one tablet, Bg 834, shows how 34 kilos were redistributed to *ko-no-si-ja*, the ethnic designation 'Knossian women'.

Fig.1: Places and Products

<i>po-ni-ki-jo</i>	Coriander	<i>pu-ka-ta-ri-ja</i> and the cloth type *168+SE	Grain on E 749
<i>qa-ra</i>	<i>qa-ra</i>	<i>qa-ra</i>	<i>qa-ra</i>
<i>ti-ri-to</i>		<i>ti-ri-to</i>	<i>ti-ri-to</i>
<i>qa-mo</i>	<i>qa-mo</i>	<i>qa-mo</i>	<i>qa-mo</i>
<i>su-ri-mo</i>	<i>su-ri-mo</i>	<i>su-ri-mo</i>	<i>su-ri-mo</i>
<i>ku-ta-to</i>	<i>ku-ta-to</i>		
<i>pu-na-so</i>	<i>pu-na-so</i>		
<i>pu-so</i>			<i>pu-so</i>
Tylissos			
*56-ko-we			
<i>da-wo</i>			

Knossos Bg 834 (scribe 137)  
[*po-ni-ki-jo*, *ko-no-si-ja* M 34 [

There are various interpretations of *po-ni-ki-jo*, which have practical implications. Foster (1977b:66) suggests alkanet, a good suggestion as *po-ni-ki-jo* is perhaps an ingredient in perfumed oil (recorded in the form of the ligature *PO*). One unit of wool can be dyed with half a unit of alkanet (Roth *et al.* 1992:32). The total collection of *po-ni-ki-jo* would thus have enabled the Mycenaeans to dye 200 kilos of wool red. However, alkanet is not a very commonly attested dye plant in antiquity.

*po-ni-ki-jo* could also be madder (Melena 1976:195-6; Barber 1991:232, n.11). This is, in my opinion, a better suggestion, since the majority of dyed textiles found in archaeological contexts are dyed with madder. For example, the analysis of dyed textiles excavated at Masada has shown that all the red textiles had been dyed with madder (Koren 1994). 100 kilos of madder roots reduce to 82.5 kilos of powder, which could dye some 200 kilos of wool (Cardon 1990:33-7; Roth *et al.* 1992:126). Madder is a mordant dye and we know that the Mycenaeans had alum - *tu-ru-pte-ri-ja* / *strufteria* - at their disposal as a mordant (PY An 35, Un 443, TI X 6, KN X 986, see also Cardon 1990:22-4; Barber 1991:236,276). The madder plant needs good soil (Cardon 1990:34) which perhaps strengthens the theory that *po-ni-ki-jo* denoted madder, since we have seen that it was often grown together with other agrarian products.

### Mycenaean colours

Barber (1998:13-6) identifies typically Aegean colour combinations of red, white and blue in Egyptian frescoes, a combination which matches well the descriptions of cloth in Knossian storerooms. Blakolmer (2000:230) also sees an Aegean 'Farbentrioika' of the colours white, red and dark/black (see also Blakolmer, this volume). In the textile records the colour red is very well represented by several terms. White is often recorded on the tablets, but

## Section One: The Creation of Colour

mostly for edging. There is, however, also white (*re-u-ka*) *pu-ka-ta-ri-ja*:

Knossos L(7) 471 (scribe 211)  
 .a ] me-zo-e  
 .b pu-]ka-ta-ri-ja , /re-u-ka TELA<sup>4</sup> + PU 10

Some works on Mycenaean society emphasise that purple cloth was for the king, and cloth with white edgings for the king's followers, *e-qe-ta*, and 'guests' (Faure 1991:312) but there is no agreement on this theory (Carlier 1984:51-3). Waetzoldt (1972:51) mentions the possibility that red cloth in Ur was meant for kings and gods. The inclination to associate purple with royalty may, in part, be influenced by our knowledge of the Roman world, and of the symbolic role of purple in Classical antiquity. It is possible that such associations were not so significant or exclusive during the Bronze Age. In the Linear B texts, we cannot be sure that the Wanax's *cloth* was purple, as the cloth ideogram is missing, and red cloth is recorded elsewhere without mention of the king. Cloth with white edgings, meanwhile, is not very exclusive, being produced *en masse*.

The Mycenaean vocabulary also includes plant names (Duhoux 1993) and other terms indirectly indicating colour substances. *e-ti-we* (*ertis*) was probably used to colour scented oil red, and is perhaps henna (*Lawsonia inermis* L., Shelmerdine 1985:26-31; Duhoux 1993:103). *ke-ra-so* (*Keraso*) is a woman's name, formed from *kerasos*, the cherry tree (*Prunus avium*). Bark of this tree can dye to rose, pink and violet colours (Cardon 1990:106; Roth *et al.* 1992:110). The vine plant (*Vitis vinifera*) is attested in the Early and Middle Helladic layers at Lerna (Hopf 1964), and is also attested through the ideogram for wine (VINUM). It can be used for dyeing red. The dark raisins dye dark red, and the leaves dye yellow (Cardon 1990:107; Roth *et al.* 1992:147). The roots of the willow tree, *e-ri-ka* (*elikas*, *Salix*) are reported to give a red-brown colour (Waldner McGrath 1977:97-8).

Red colours could also be obtained from a number of other plants, some of which are known from the paleobotany of Lerna and Tiryns. These include bedstraw (*Gallium*, Kroll 1982:478; Hansen 1991:69-71) and dwarf elder (*Sambucus ebulus*, Kroll 1982:481) whose berries dye brown and red (Cardon 1990:104-5). Finally, the Mycenaean may have used red dyes from the lichen (*Rochella tinctoria*) or from kermes. However, the best and fastest red dyes are obtained from madder.

### Conclusions on Red Colours in Textiles

The Mycenaean coloured their wool and cloth red with both murex and safflower. The term *e-ru-ta-ra* is, on the one hand, a colour-term used for red cloth and red hides, but *ka-na-ko e-ru-ta-ra* also, in my opinion, shows that safflower florets were used as a dye substance. The red dye substance *po-ni-ki-jo* was most probably madder. The 980 pieces of red *pu-ka-ta-ri-ja* cloth, designated as *pu-ru-wa*, could be a totalling record of cloth dyed with various red dyes, but I find the possibility that *pu-ru-wa* simply designates a natural red-brown wool colour very attractive. Finally, I agree with Palaima's (1991:291) conclusion that "on Mycenaean Crete, purple dye was applied to a particular kind of cloth." This cloth was the *pu-ka-ta-ri-ja* cloth. *pa-we-a* cloth could also be decorated in various colours, but *pu-ka-ta-ri-ja* cloth is the only type of textile which we find described as entirely white or coloured.



## Section One: The Creation of Colour

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## Section One: The Creation of Colour

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