Farmers in Transition

The archaeobotanical analysis of the Carpathian Basin from the Late Neolithic to the Late Bronze Age (5000-900 BC)

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Abstract

This thesis examines the development of agriculture within the Carpathian Basin from the Late Neolithic to the Late Bronze Age. Information on prehistoric crop practices within Croatia have been absent from current debates on the spread and development of agriculture in Southeast Europe. The aim of the study is to examine new archaeobotanical data and provide information on subsistence practices within Croatia and integrate these results with those available from the wider region of the Carpathian Basin. The re-examination of archaeobotanical material from Late Bronze Age Feudvar has also allowed the identification of crop husbandry regimes at the site level.

The results indicate continuous crop cultivation, as well as the collection of wild resources, within Croatia from the Late Neolithic to the Late Bronze. At Feudvar, crop processing analysis indicated that a number of socio-economic factors dictated whether a crop was fully cleaned after the harvest, sieved at a later stage or left full of impurities. Further investigation into ecological characteristics of weed species within three groups of samples (unsieved spikelets, products and fine sieving by-products) identified the practice of two distinct crop husbandry regimes at Feudvar. The first represents small-scale intensive cultivation associated with the wheat crops (i.e. einkorn and emmer) and the second, a more large-scale extensive husbandry regime associated with barley. Integrating these results within the wider geographical area showed regional and temporal variations in the crops cultivated that are likely linked to personal choice and socio-economic influences rather than environmental constraints.

This study advances our knowledge on farming practices within the Carpathian Basin and demonstrates the importance of archaeobotanical data to debates on socio-economic and technological change in prehistory.

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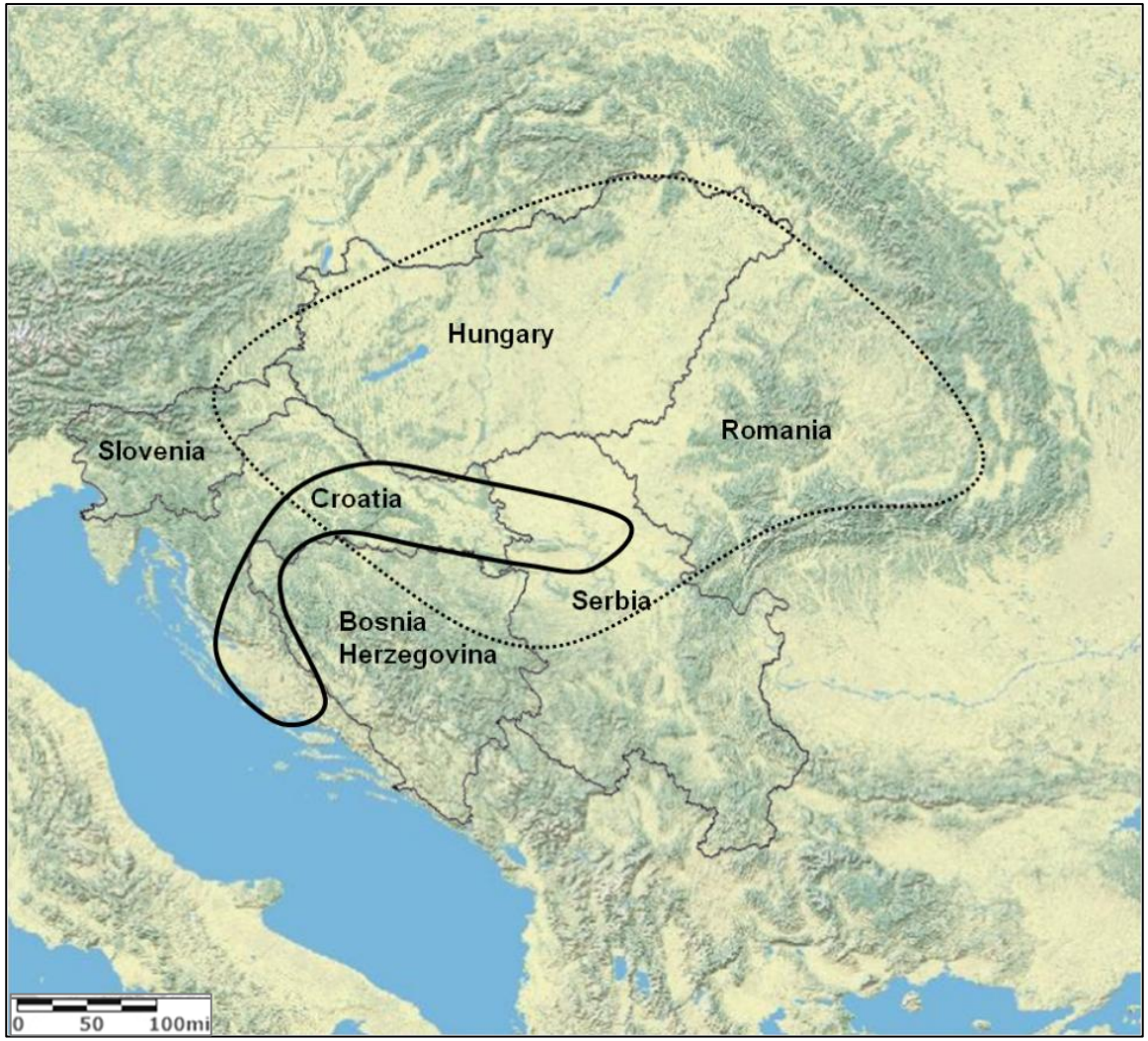


Fig 2.1. Outline of the Carpathian Basin and the core study area within Croatia and northern Serbia. Base map U.S. National Park Service (NPS) 2009

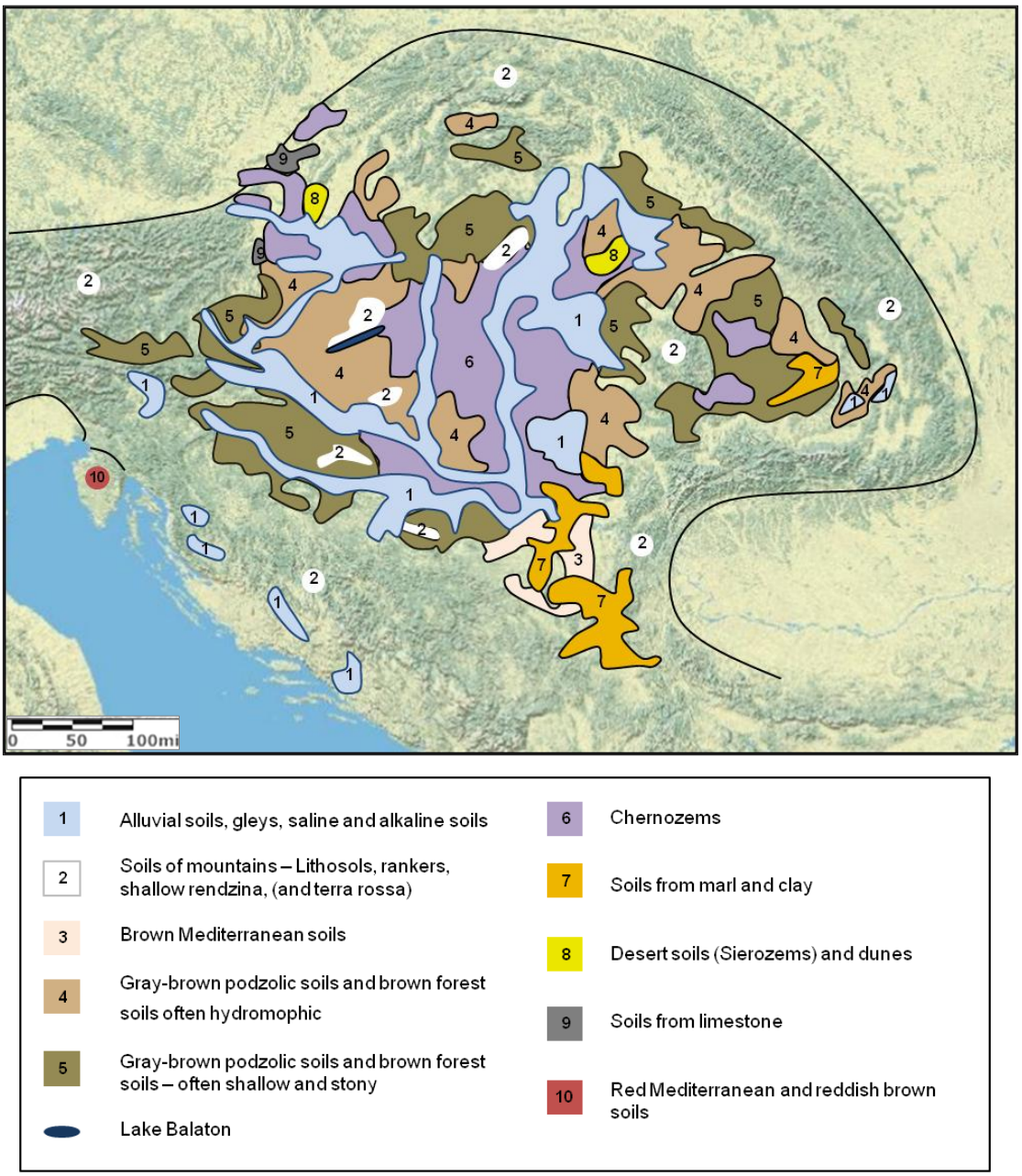


Fig 2.2a. Soil map of the Carpathian Basin. (After European Digital Archive of Soil Maps (EuDASM) 2005)

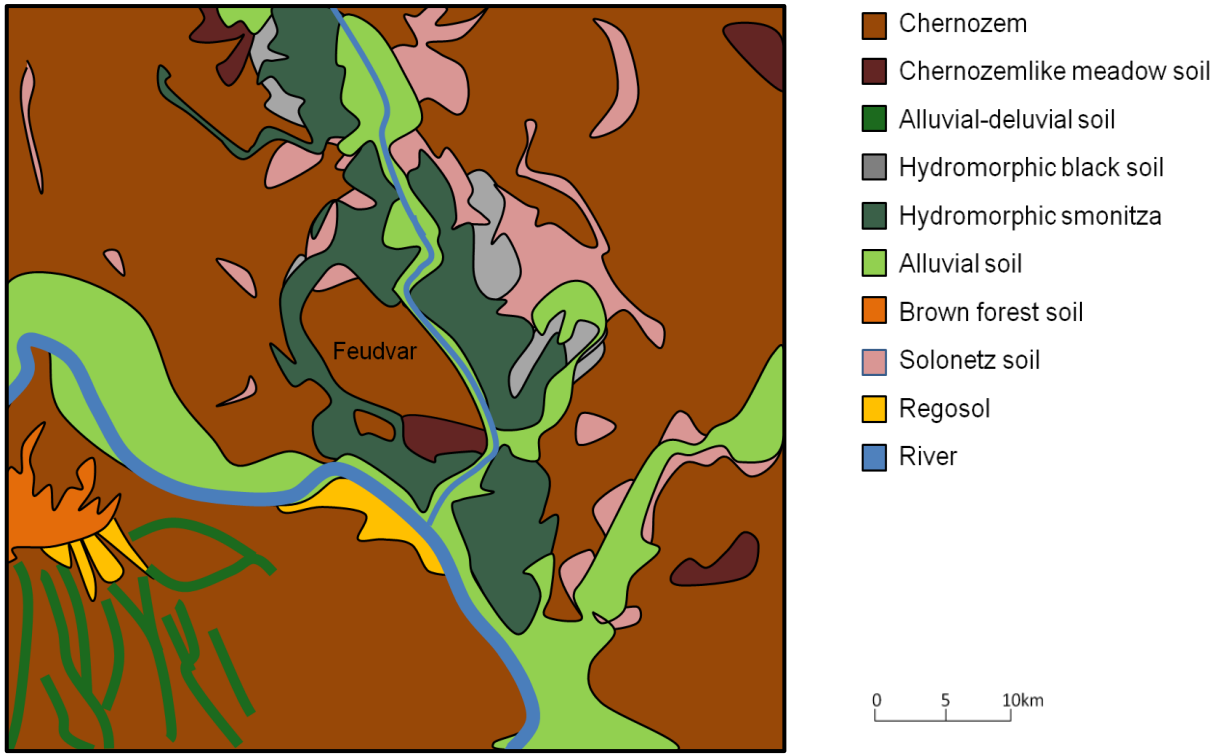


Fig 2.2b. Soil map of the Titel plateau (Feudvar settlement) and the surrounding area. Adapted from (Benka 2006)

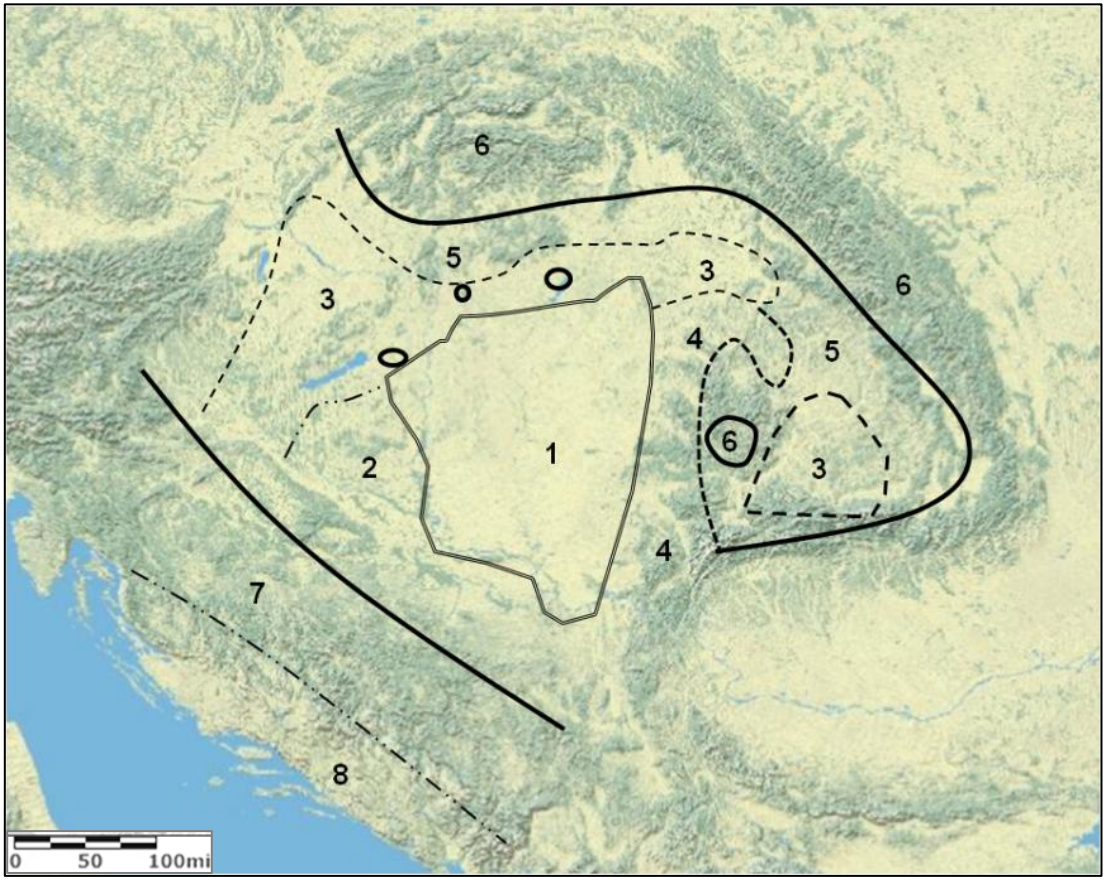


Fig 2.3. Vegetation zones in the Carpathian Basin.

(1) Pannonian forest steppe; (2) Sub-Mediterranean oak forest; (3) Central European and sub-Mediterranean mixed oak forest; (4) Balcanic oak forest; (5) Central European oak forest; (6) Sub alpine and alpine, beech and needle-leaved forest; (7) Pine and beech forest; (8) Pine and oak forest (adapted from Rudner and Sümegi 2001:180 Fig. 4)

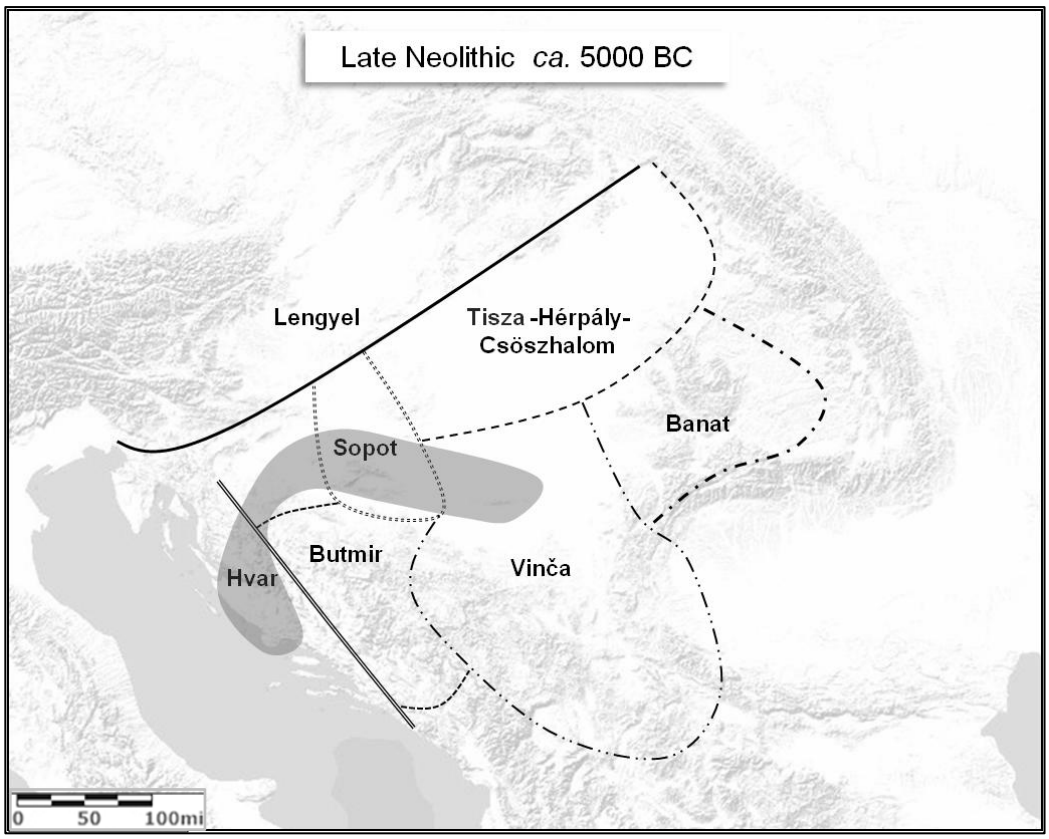


Fig 2.4. Outline of cultural groups present in the Carpathian Basin *ca*. 5000 BC. Core study area is shaded.

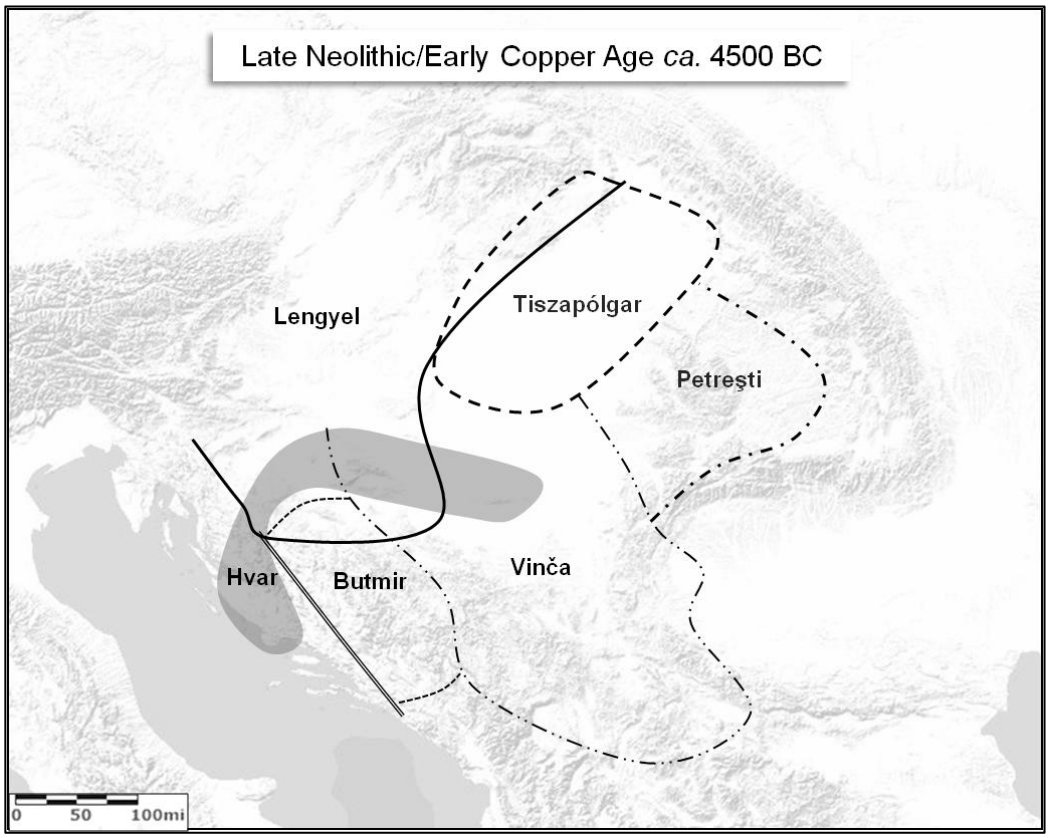


Fig 2.5. Outline of cultural groups present *ca.* 4500 BC. Core study area is shaded.

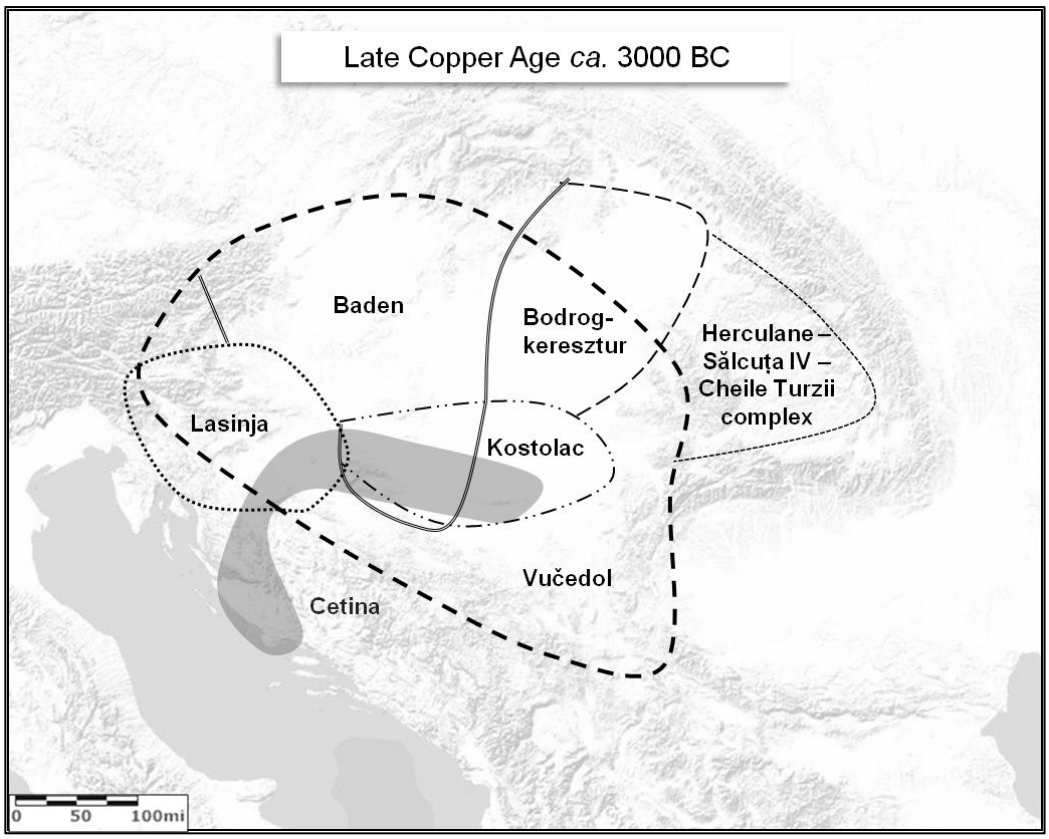


Fig 2.6. Outline of cultural groups present *ca.* 3000 BC. Core study area is shaded.

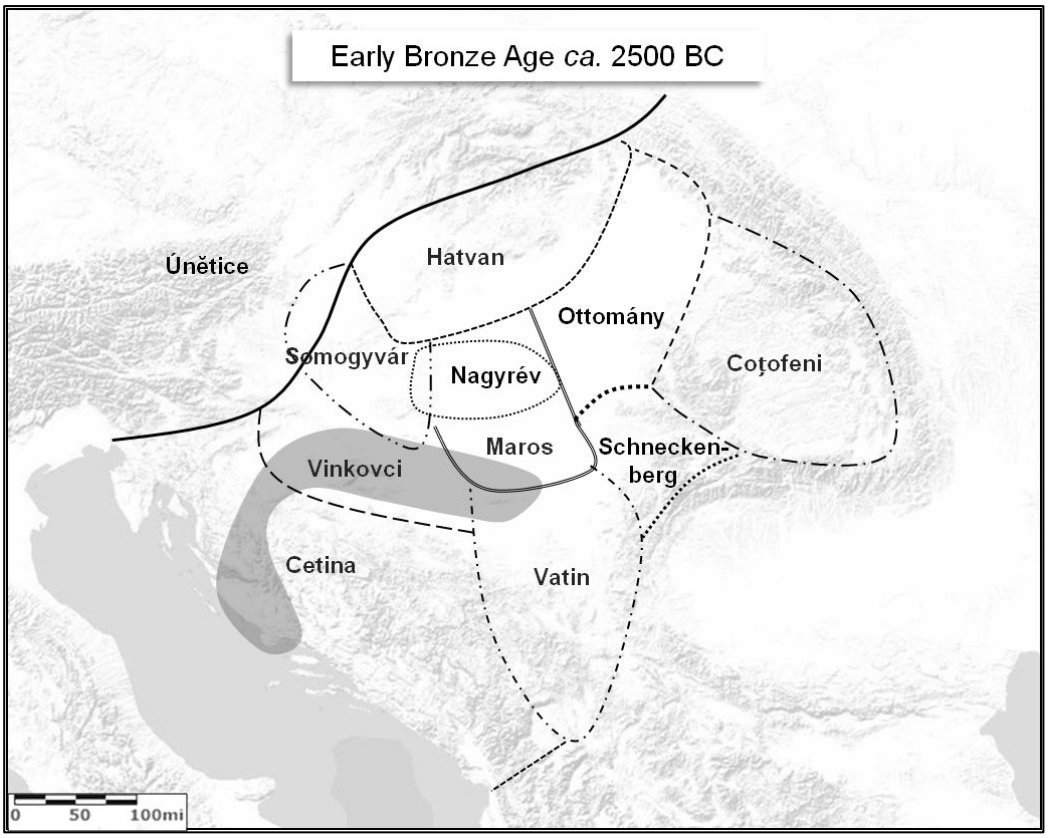


Fig 2.7. Outline of cultural groups present *ca.* 2500 BC. Core study area is shaded.

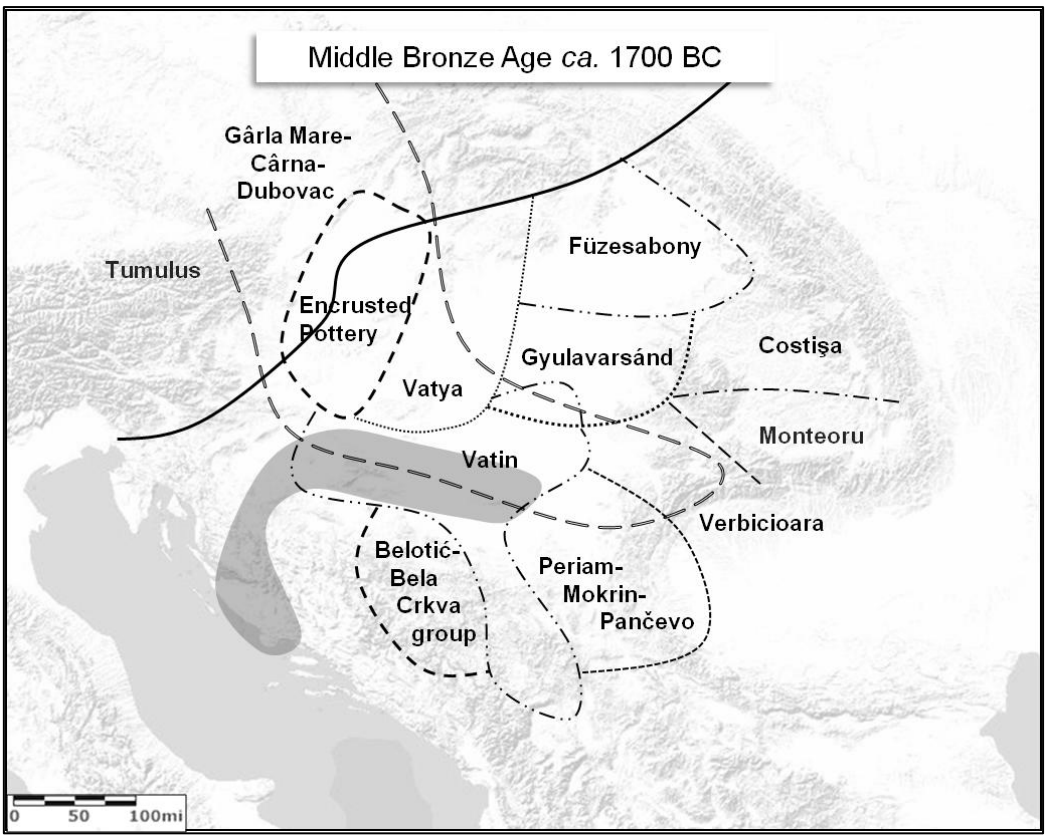


Fig 2.8. Outline of cultural groups present *ca.* 1700 BC. Core study area is shaded.

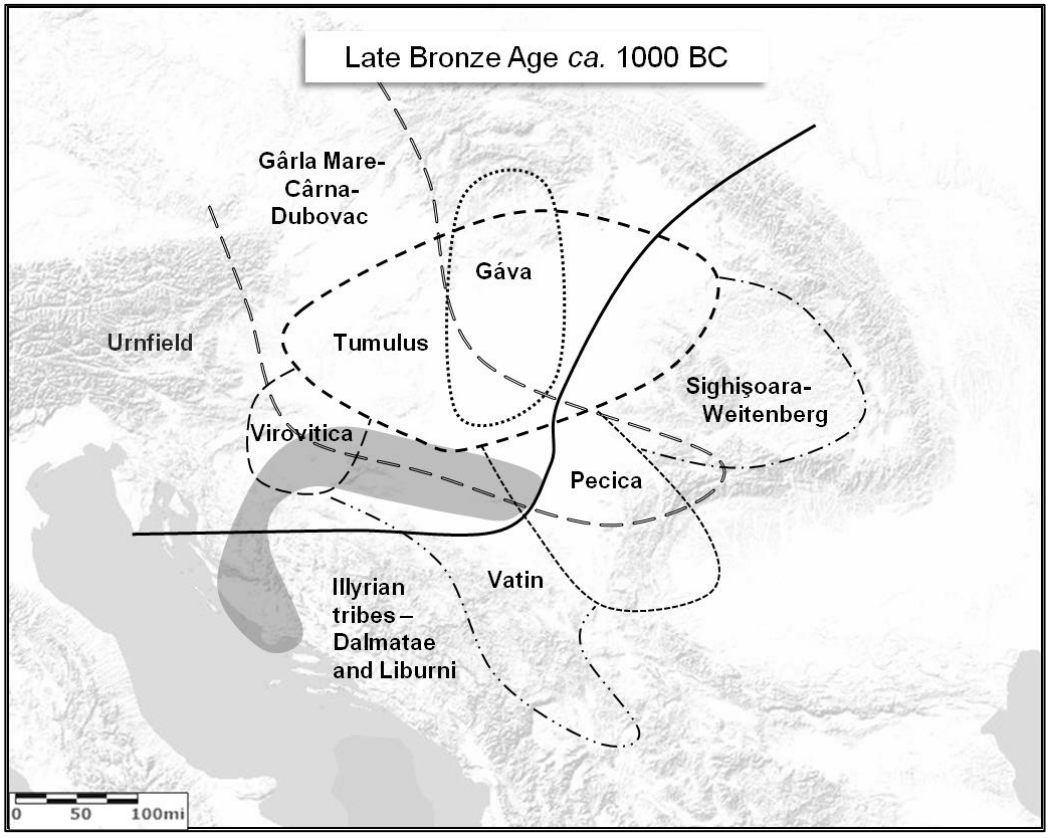


Fig 2.9. Outline of cultural groups present *ca.* 1000 BC. Core study area is shaded.

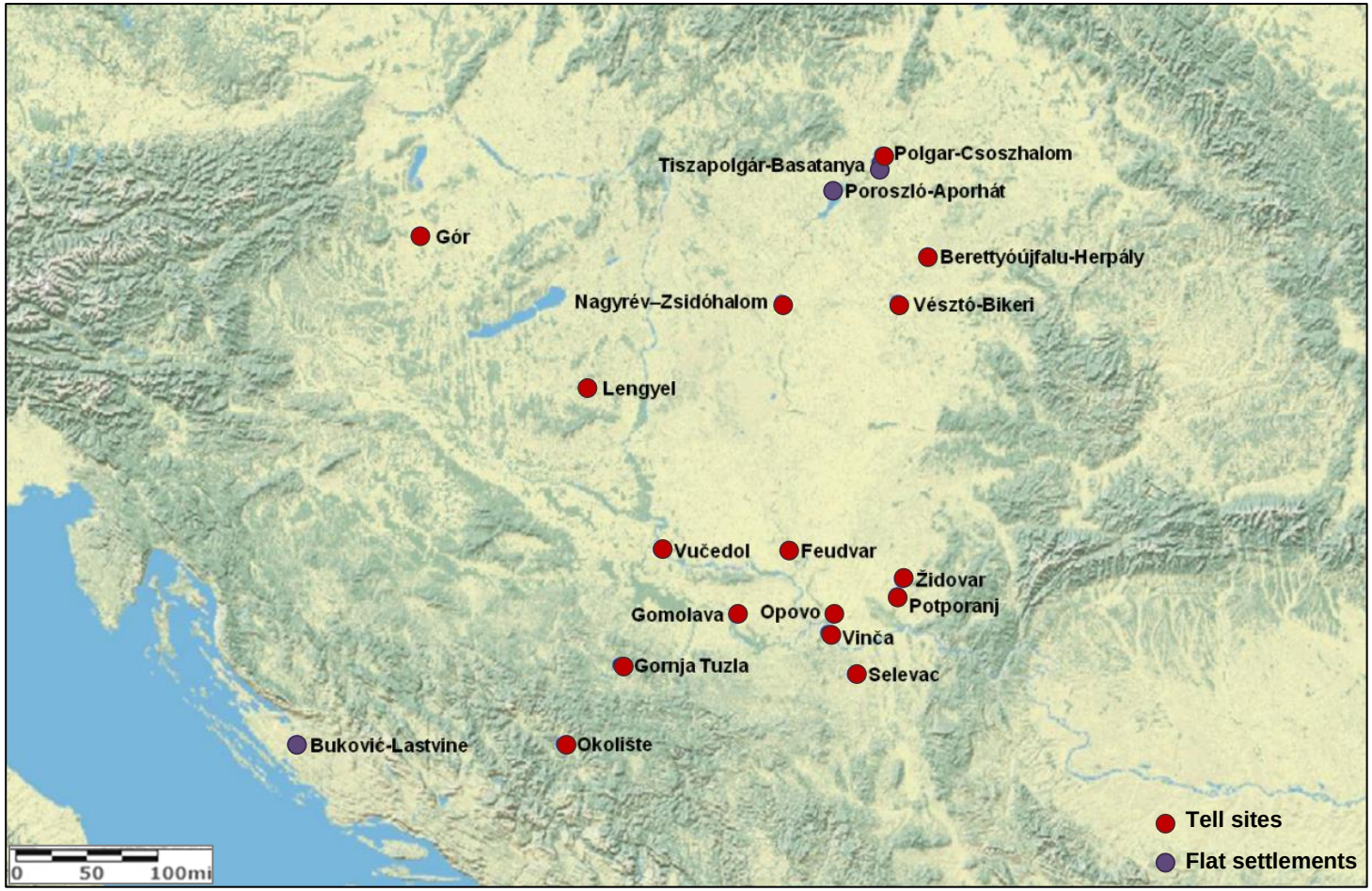


Fig 2.10. Map of the main tell and flat sites within the Carpathian Basin discussed in Chapter 2

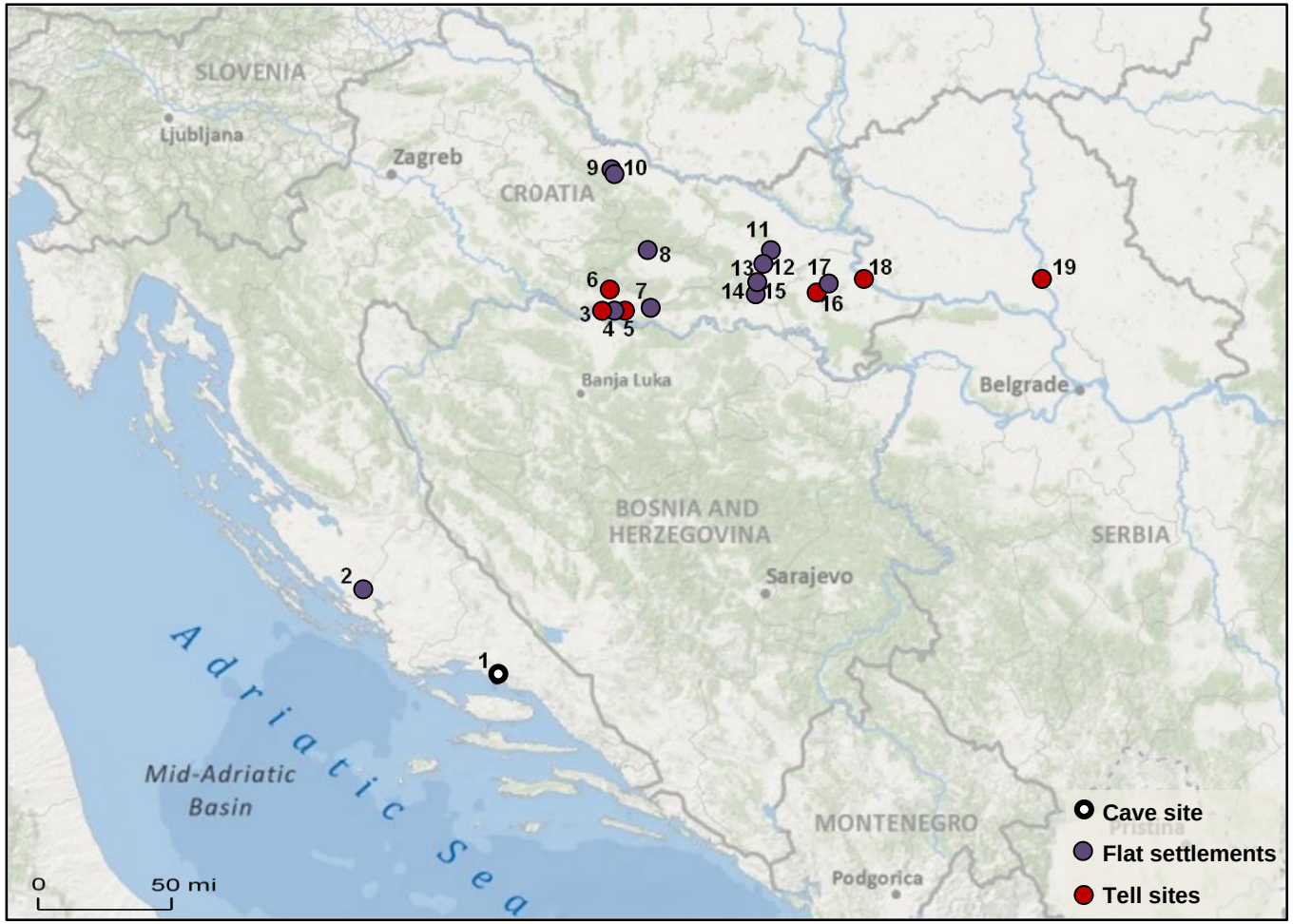


Fig 4.1. Locations of the study sites. Base map GEBCO, NOAA, National Geographic, DeLorme, and Esri Ocean Basemap 2008.
1. Turska Peć, 2. Cista Mala Velištak, 3. Mačkovac Crišnjevi, 4. Crišnjevi – Oštrov, 5. Orubica-Veliki Šeš, 6. Slavča, 7. Ravnjas, 8. Potočani, 9. Virovitica-Batelije, 10. Virovitica-Brekinja, 11. Ivandvor-Gaj, 12. Pajtenica-Velike Livade, 13. Jurjevac-Stara Vodenica, 14. Tomašanci - Palača, 15. Đakovo-Franjevac, 16. Sopot , 17. Vinkovci, 14 Matije Gupca, 18. Vučedol, 19. Feudvar

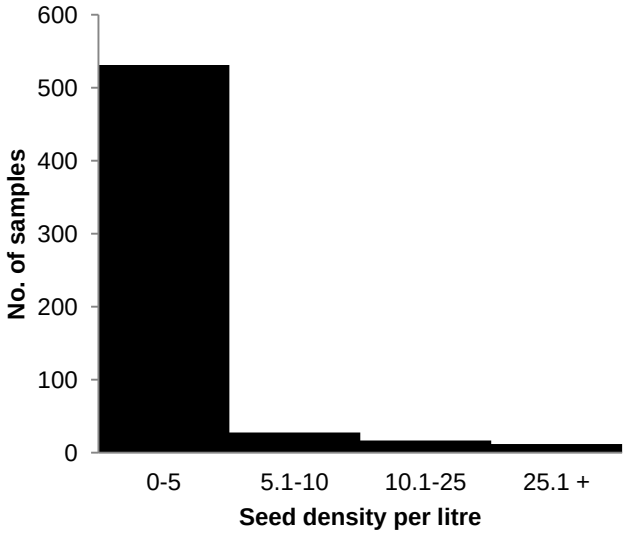


Figure 4.2. Number of samples per density group for the 18 Croatian sites (n=565)

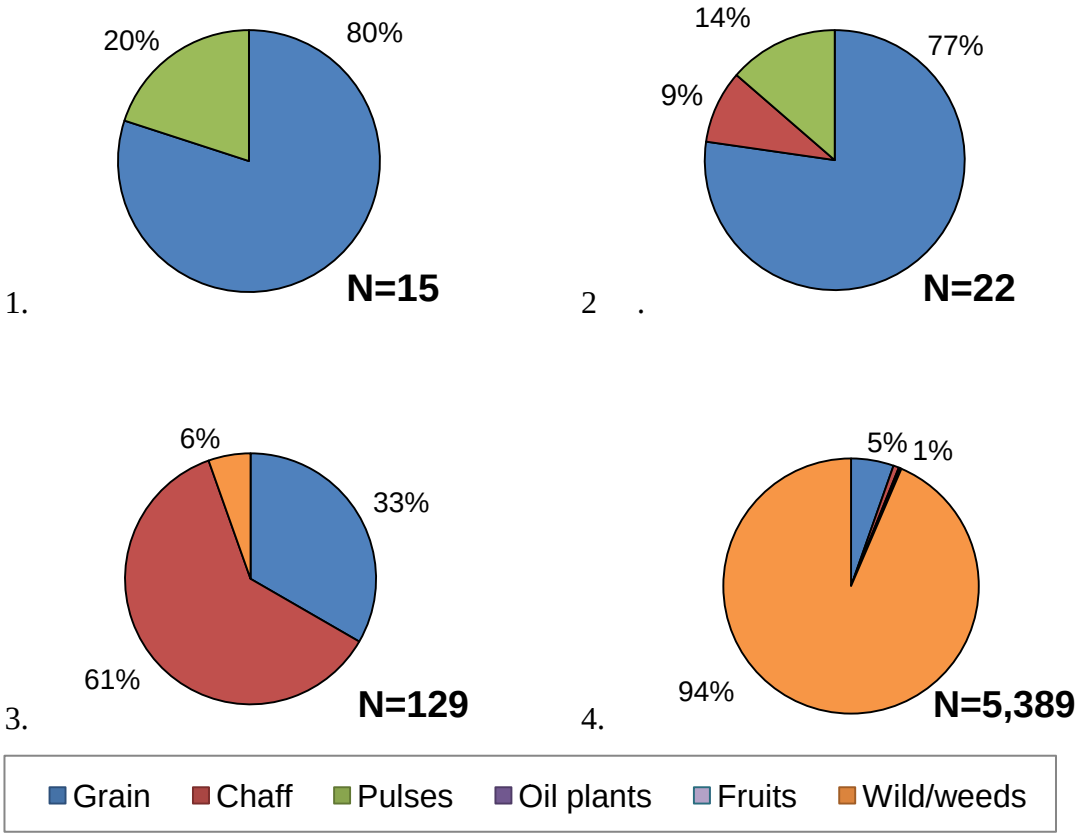


Fig 4.3. Pie charts representing the percentage of seeds allocated to a particular plant category per site: Mid/Late Neolithic.Croatia. 1. Virovitica-Brekinja, 2. Ivandvor-Gaj, 3. Čista Mala Valištak, 4. Turska Peć , 5. Sopot, 6. Slavča, 7. Ravnjaš

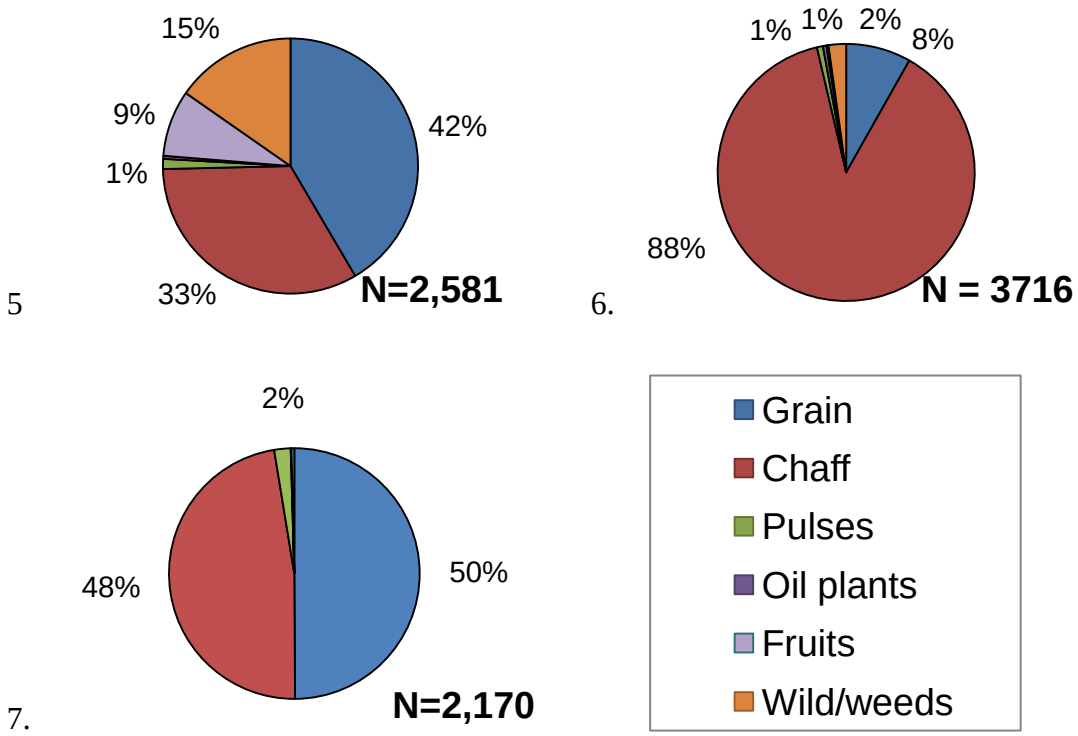


Fig 4.3. (Continued)

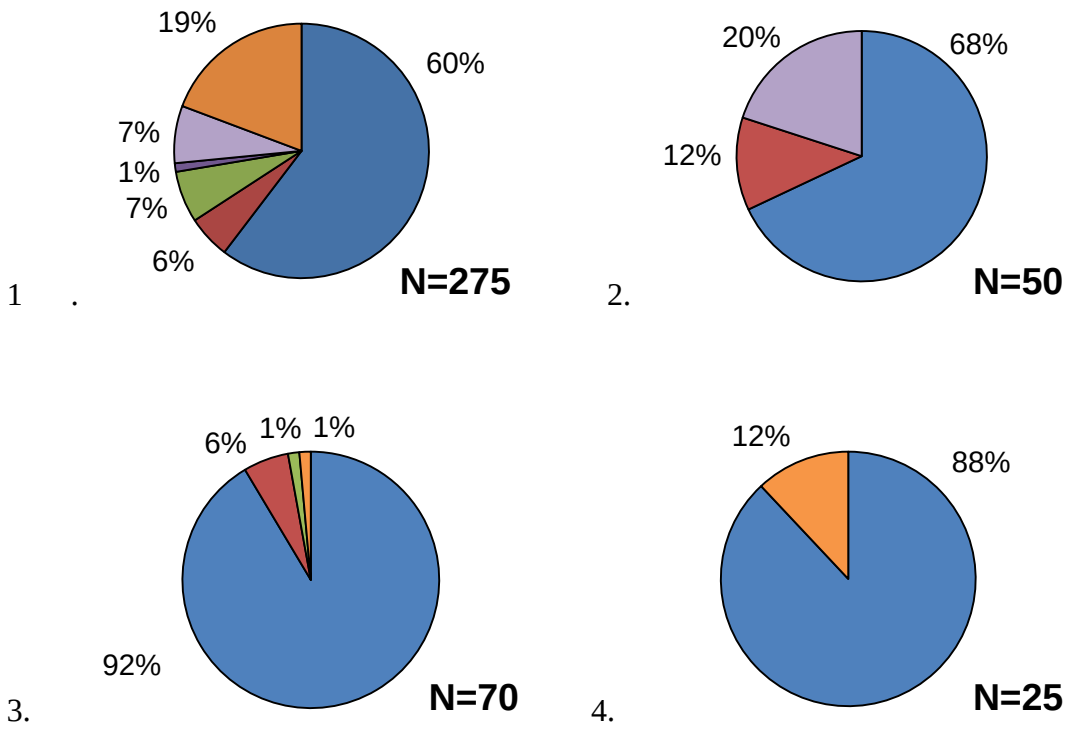
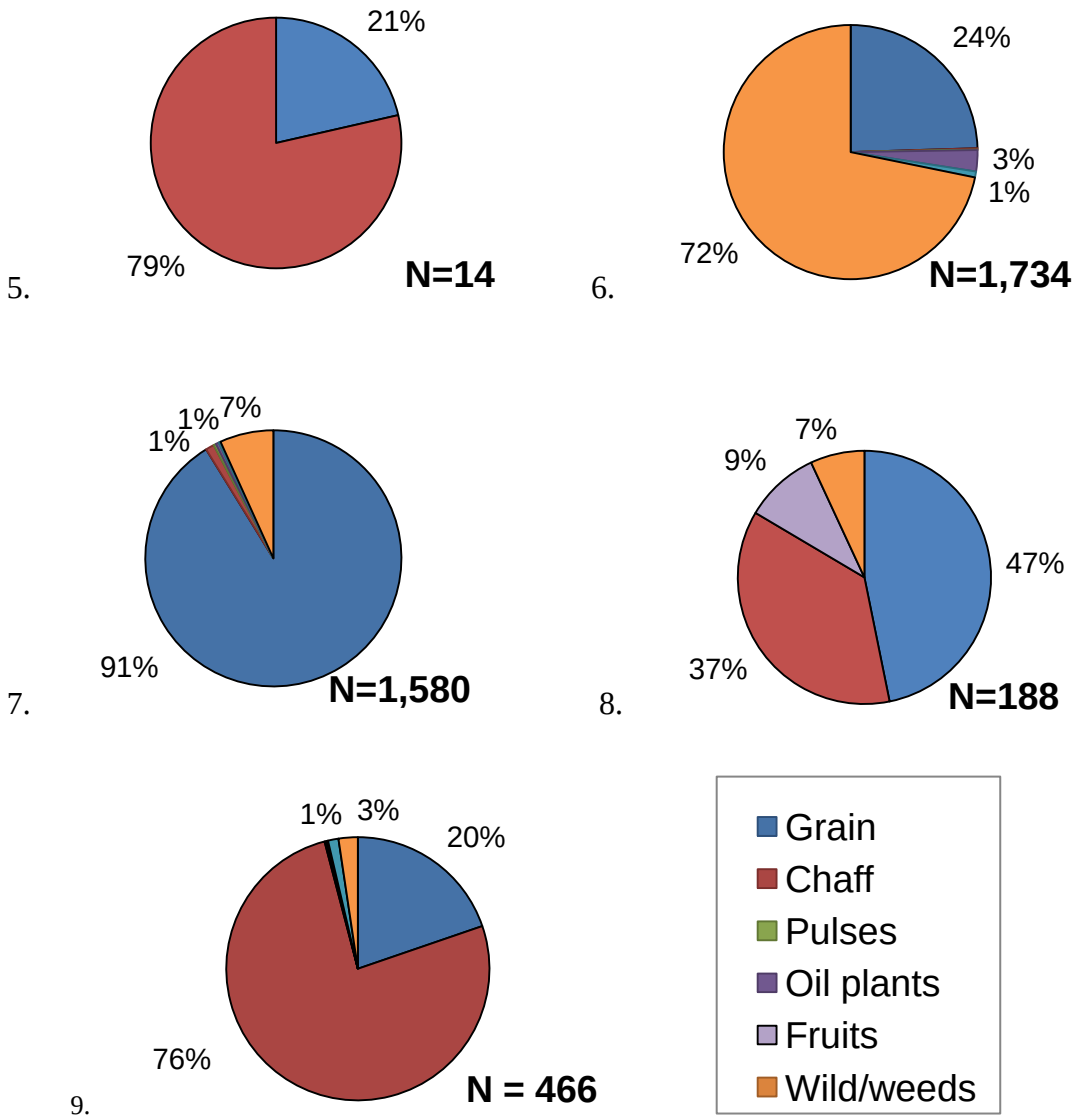


Fig 4.4. Pie charts representing the percentage of seeds allocated to a particular plant category per site: Copper Age Croatia.1. Đakovo-Franjevac, 2. Jurjevac-Stara Vodenica, 3. Potočani, 4. Pajtenica-Velike Livade, 5. Virovitica-Batelije, 6. Vinkovci/ Matije Gupca 14, 7. Vučedol, 8. Tomašanci–Palača, 9. Slavča



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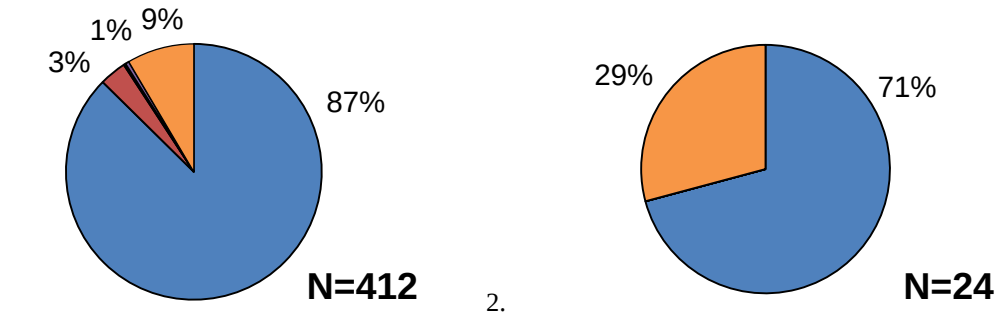
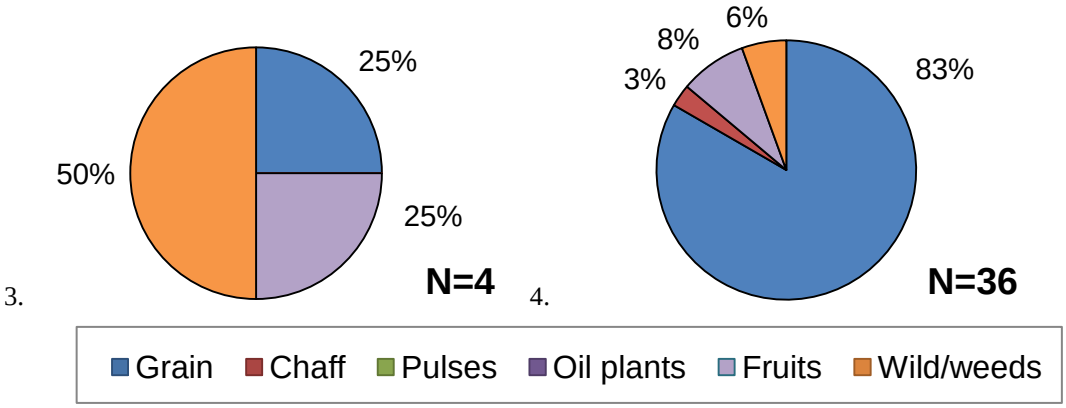


Fig 4.5. Pie charts representing the percentage of seeds allocated to a particular plant category per site: Late Bronze Age Croatia. 1.Mačkovac Crišnjevi, 2. Crišnjevi-Oštrov, 3.Orubica-Veliki Šeš, 4. Tomašanci – Palača



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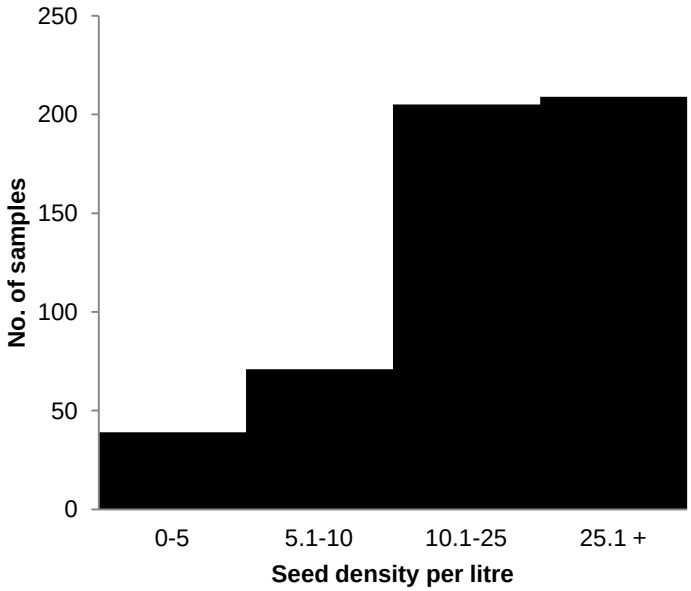


Fig 5.1. Number of samples per density group: Late Bronze Age Feudvar (n=524)

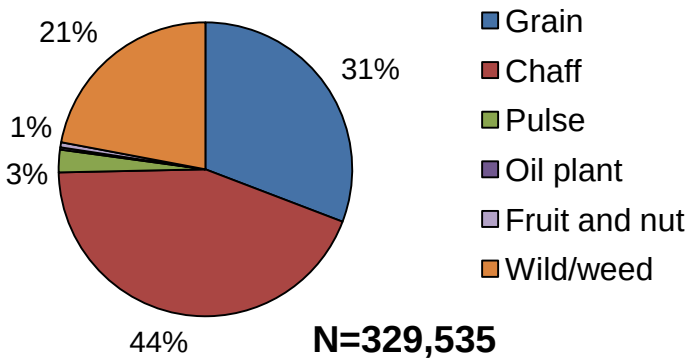


Fig 5.2. Pie chart representing the percentage of seeds allocated to a particular plant category: Late Bronze Age Feudvar

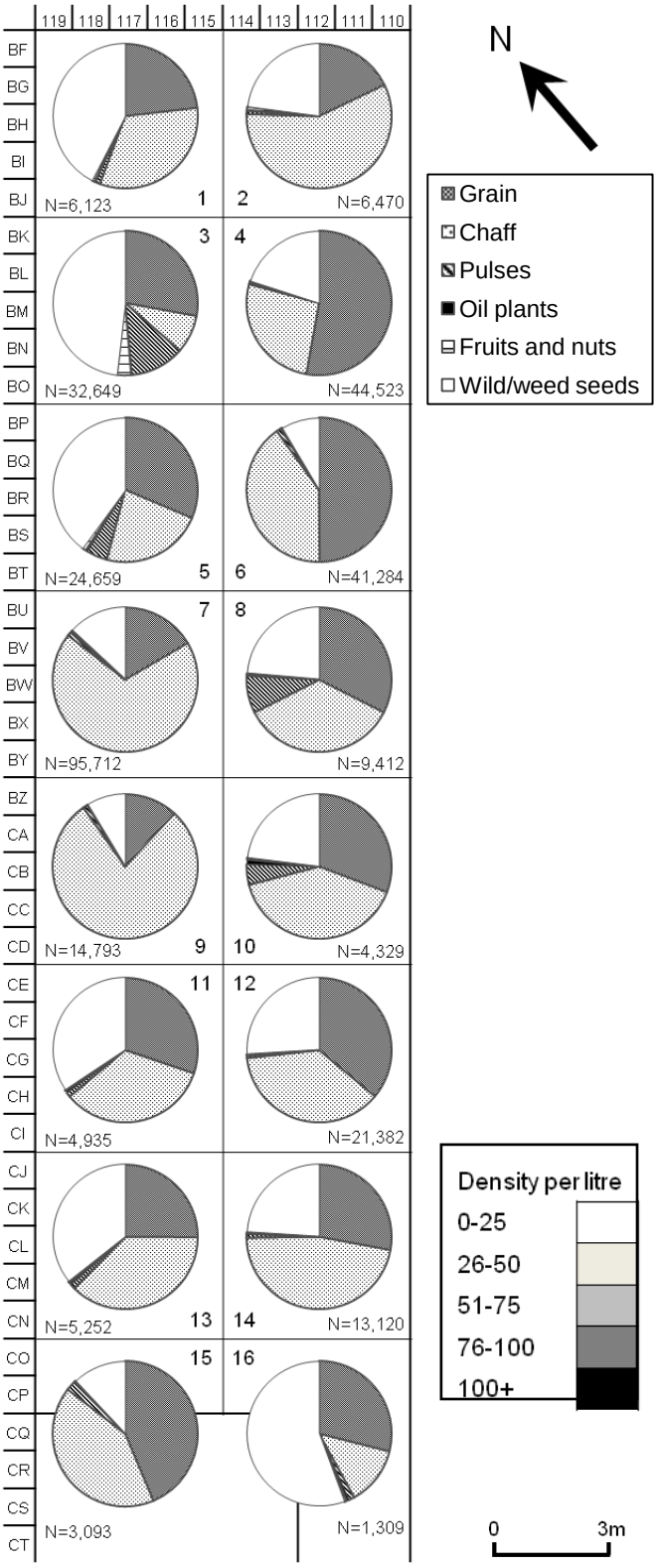


Fig 5.3. Pie charts representing the percentage of seeds allocated to a particular plant category per block: Late Bronze Age Feudvar

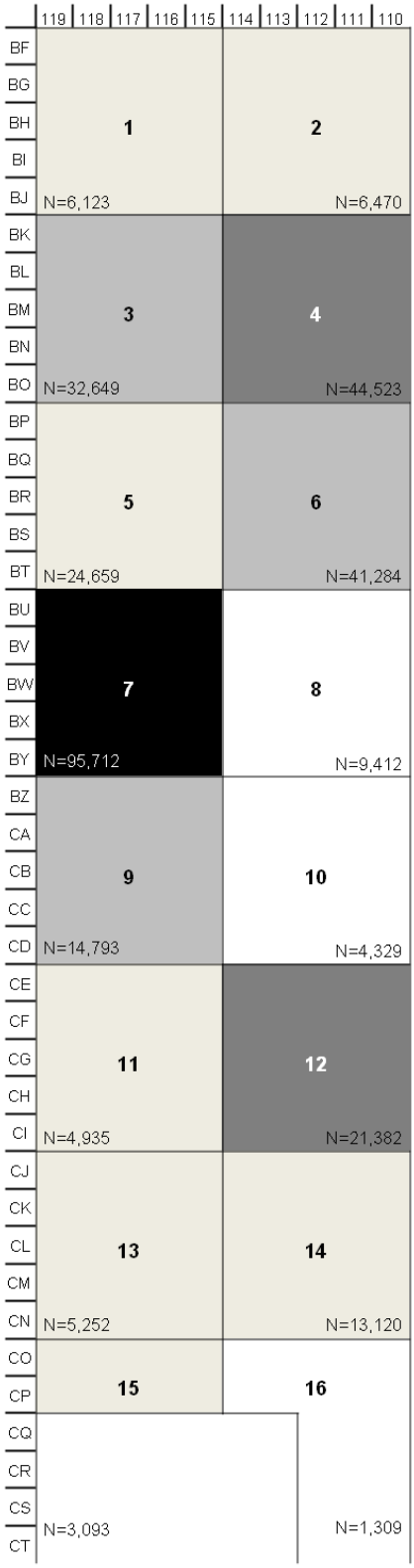


Fig 5.4. Average seed density per litre of sediment per block: Late Bronze Age Feudvar

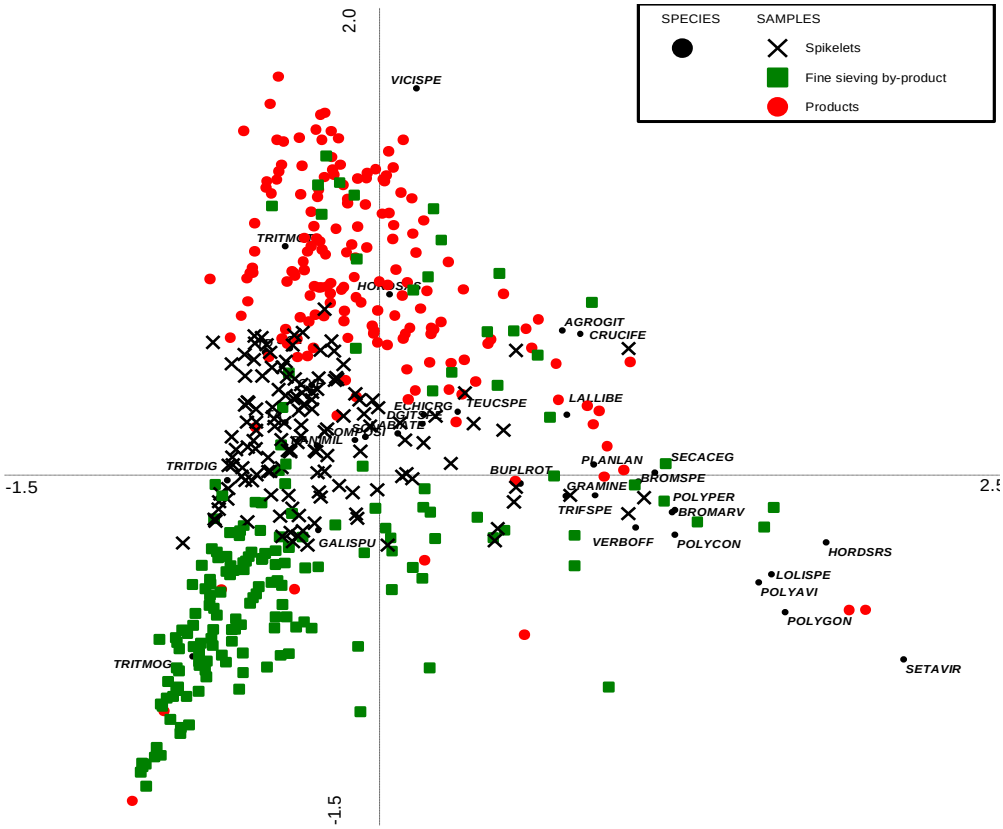


Fig 6.1. Correspondence analysis of the Feudvar samples (> 50 identifications and > 10% weed species) classified by the crop processing stage, as identified by the ratio analysis, on the first two principal axes (axis 1 horizontal, axis 2 vertical): LBA Feudvar

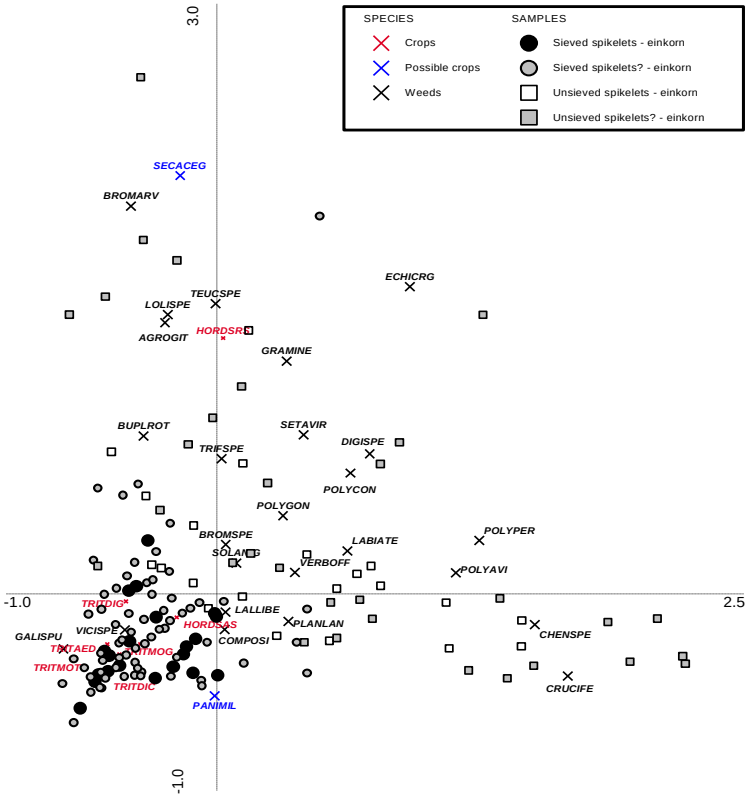


Fig 6.2. Correspondence analysis of samples identified as sieved and unsieved einkorn spikelets: LBA Feudvar

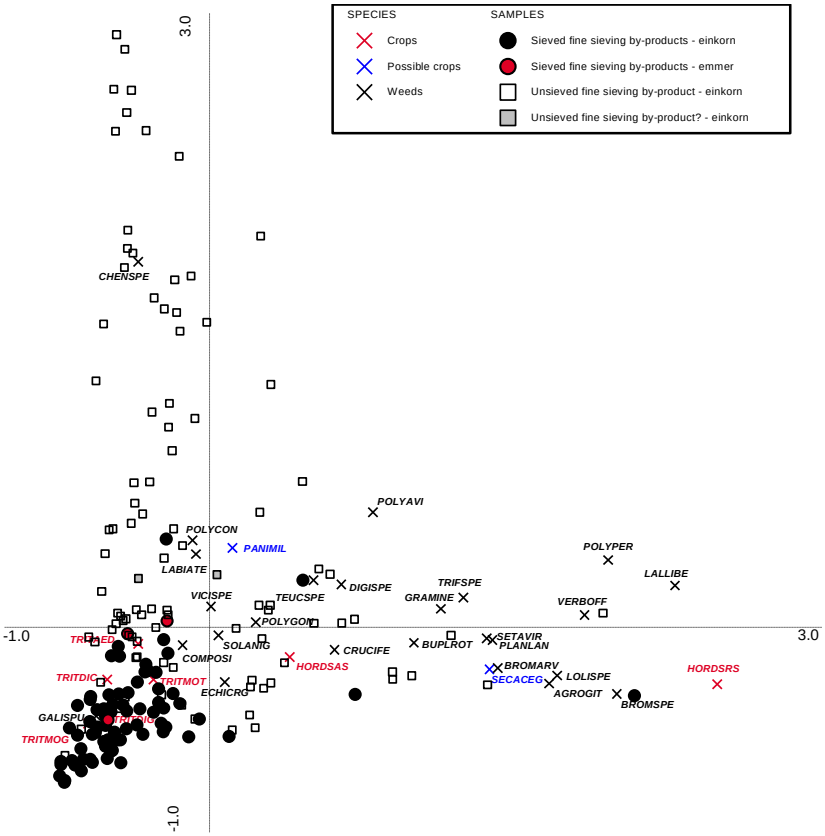


Fig 6.3. Correspondence analysis of samples identified as sieved and unsieved fine sieving by-products: LBA Feudvar

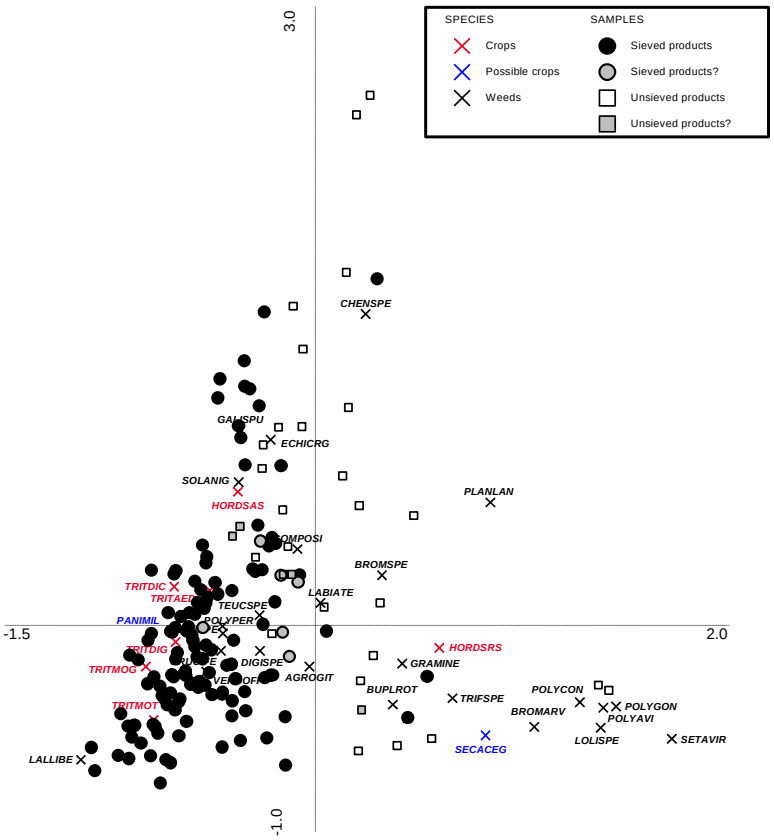


Fig 6.4. Correspondence analysis of samples identified as sieved and unsieved products: LBA Feudvar

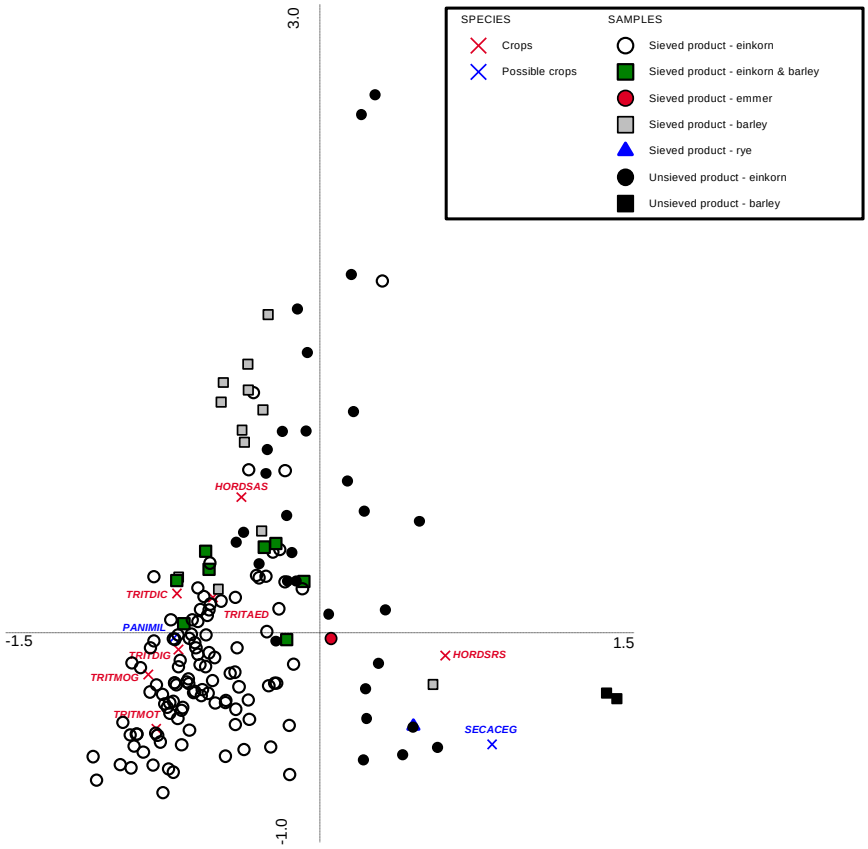


Fig 6.5. Correspondence analysis of samples identified to specific crop products: LBA Feudvar

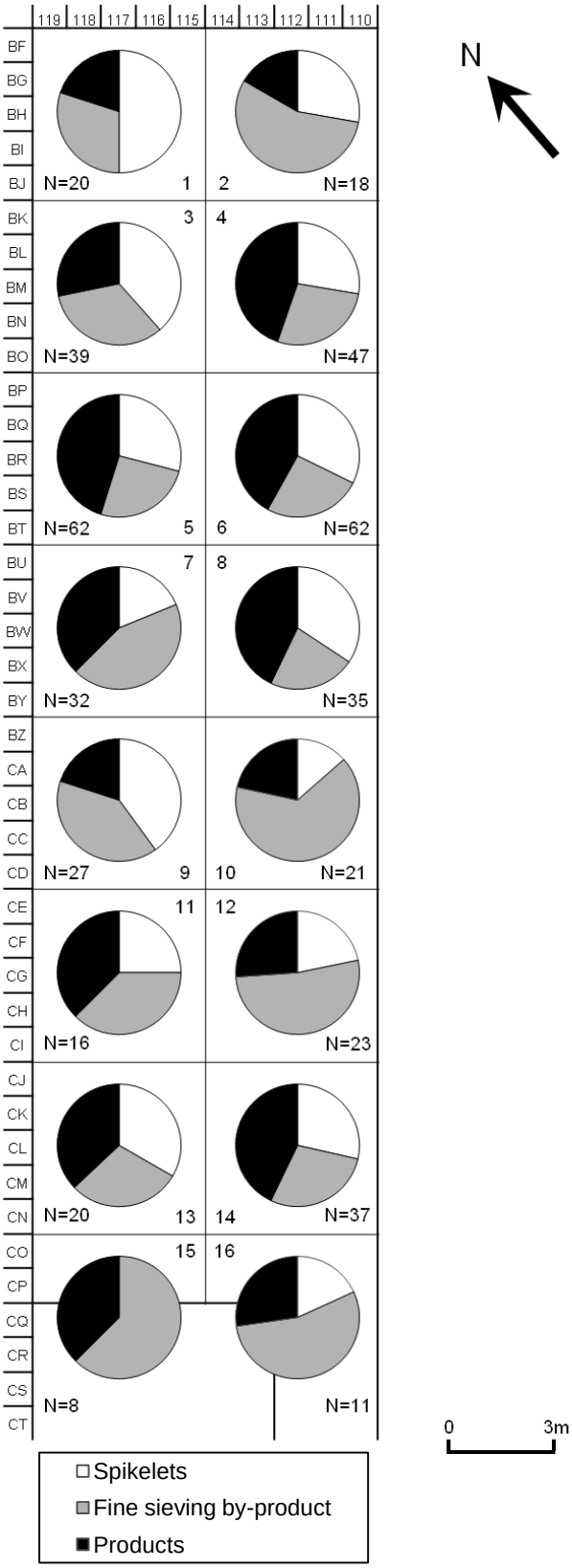


Fig. 6.6. Pie charts representing the percentage of samples identified as spikelets, fine sieving by-products and products per 5x5m area: LBA Feudvar

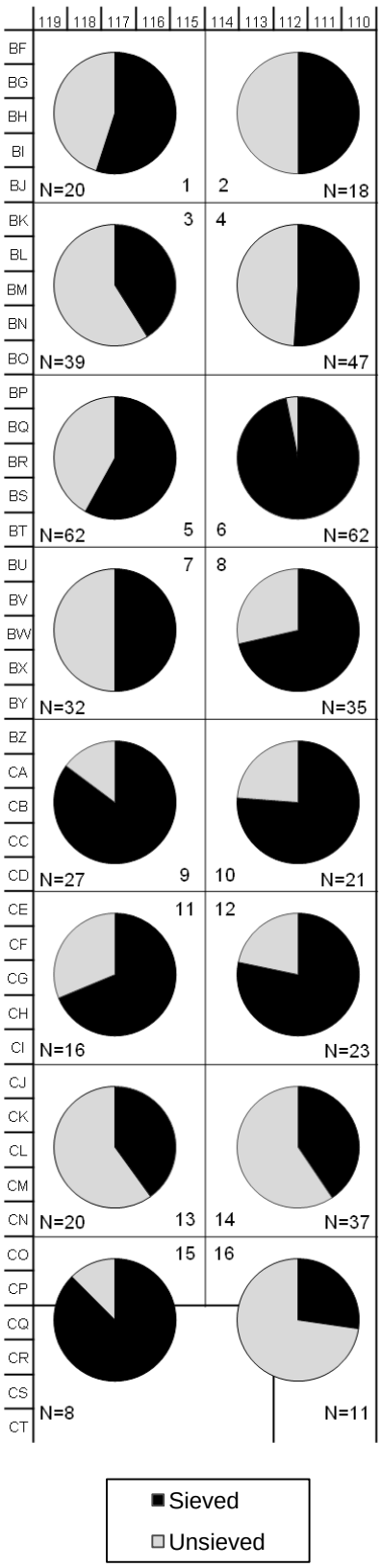


Fig 6.7. Pie charts representing the percentage of samples identified as sieved and unsieved (regardless of crop processing stage) per 5x5m area: LBA Feudvar

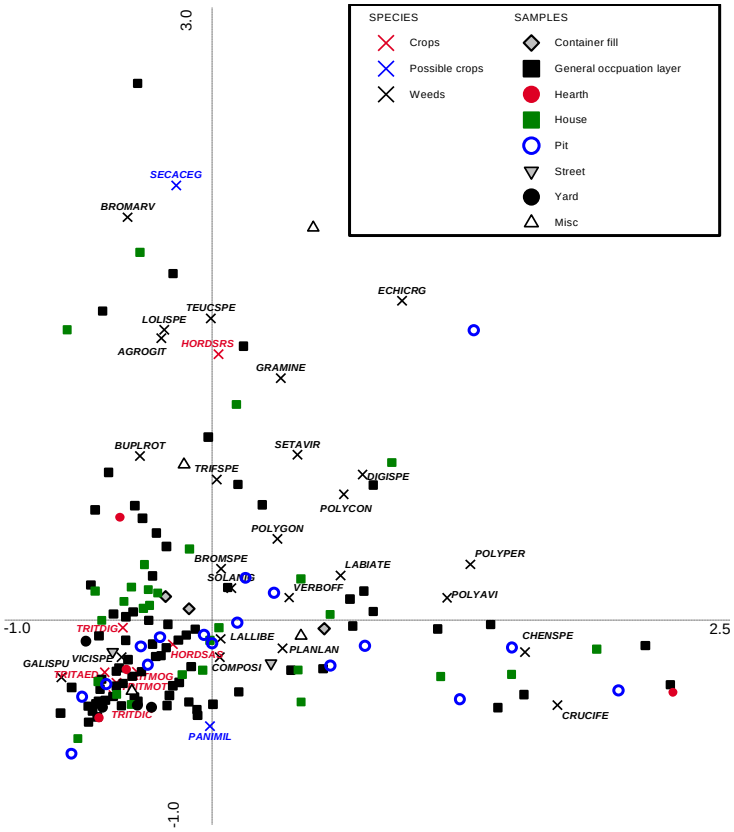


Fig 6.8. Correspondence analysis of samples identified as spikelets per feature type: LBA Feudvar

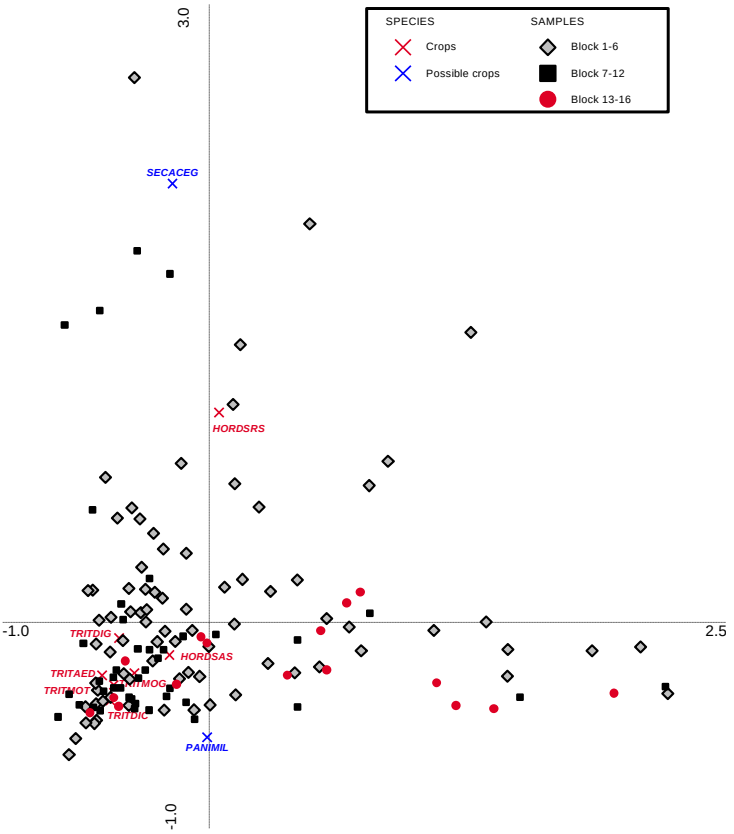


Fig 6.9. Correspondence analysis of samples identified as spikelets per area/block within the trench: LBA Feudvar

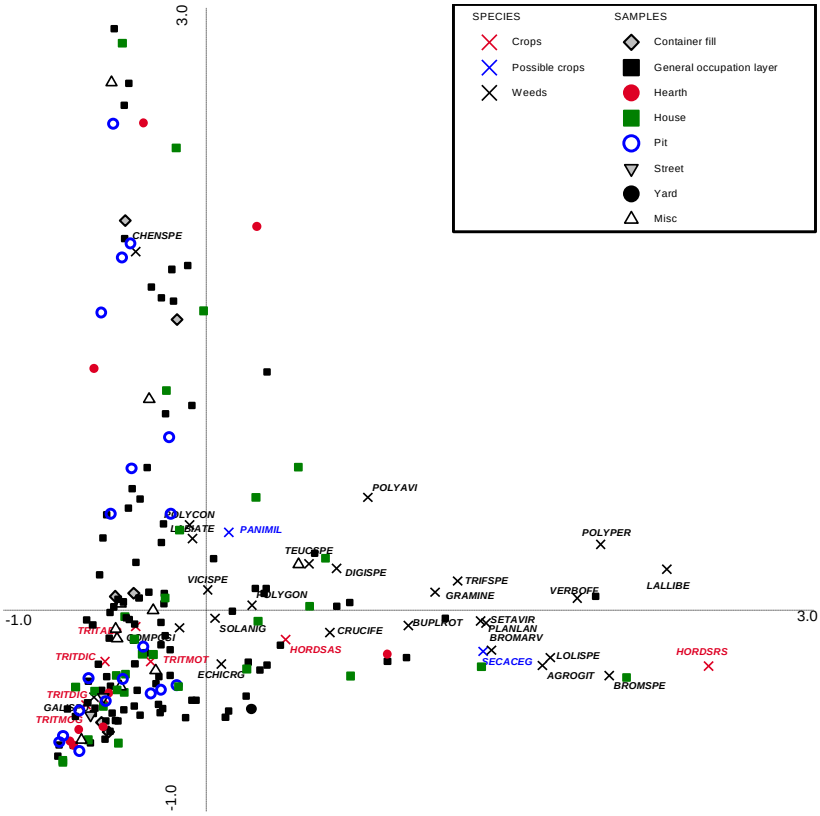


Fig 6.10. Correspondence analysis of samples identified as fine sieving by-products per feature type: LBA Feudvar

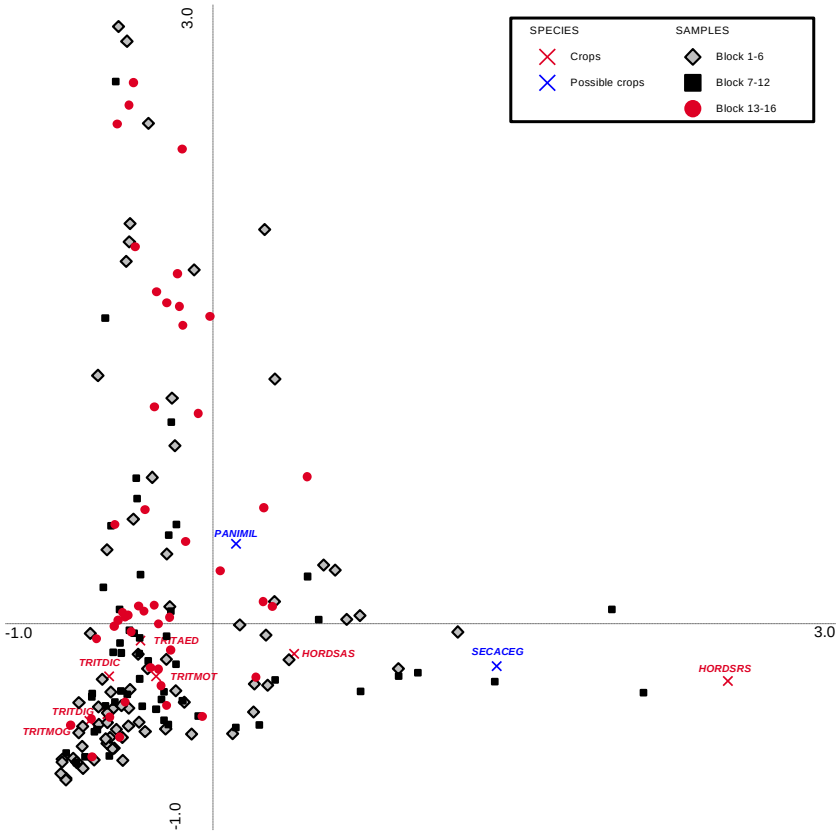


Fig 6.11. Correspondence analysis of samples identified as fine sieving by-products per area/block within the trench: LBA Feudvar

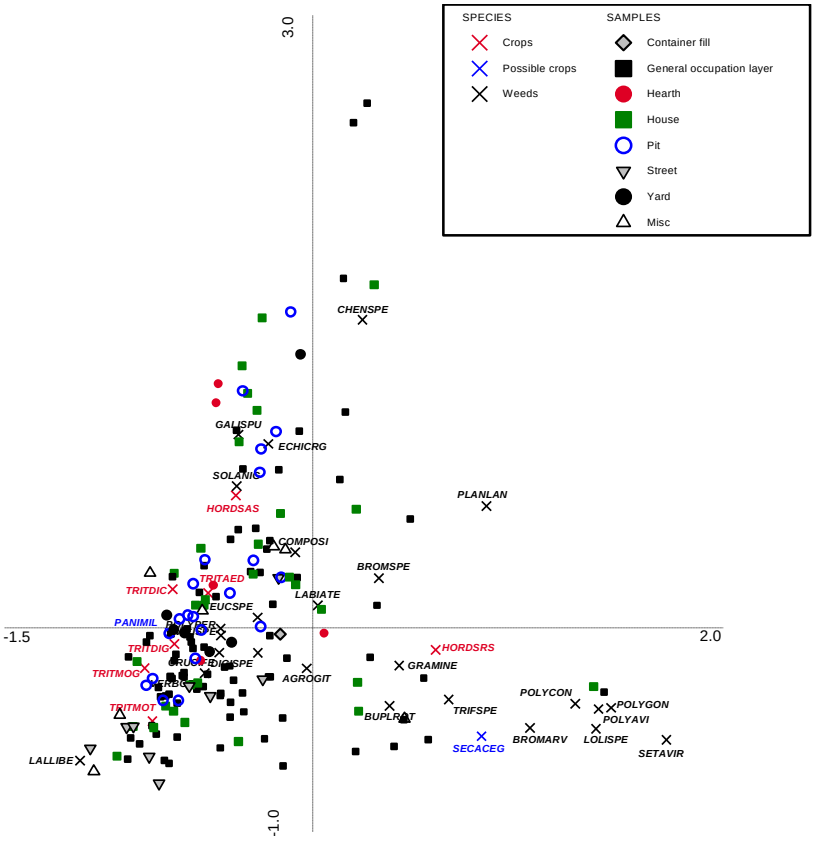


Fig 6.12. Correspondence analysis of samples identified as products per feature type: LBA Feudvar

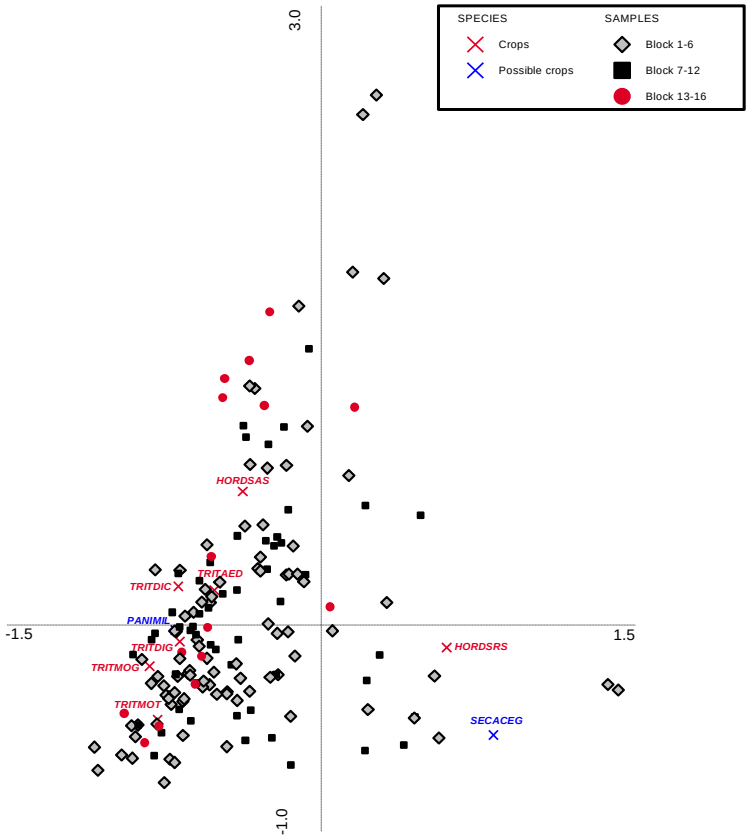


Fig 6.13. Correspondence analysis of samples identified as products per area/block within the trench: LBA Feudvar

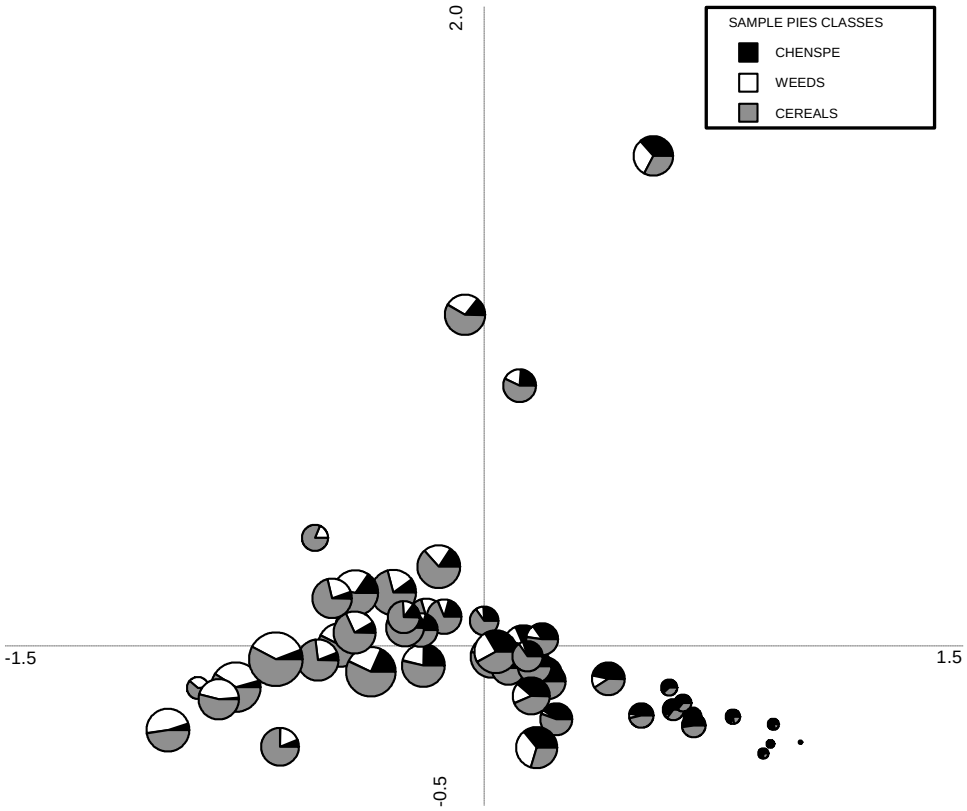


Fig 7.1. Unsieved spikelets - Shannon diversity examining the impact of Chenopodium on sample composition: LBA Feudvar.

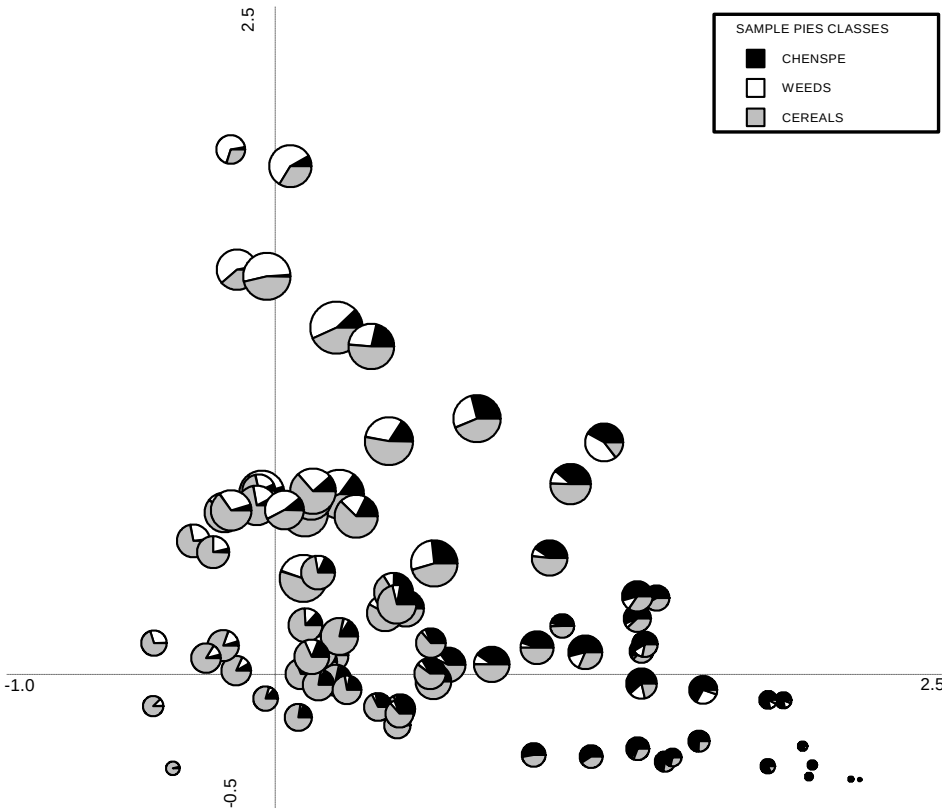


Fig 7.2. Unsieved fine sieving by-produces - Shannon diversity examining the impact of Chenopodium on sample composition: LBA Feudvar.

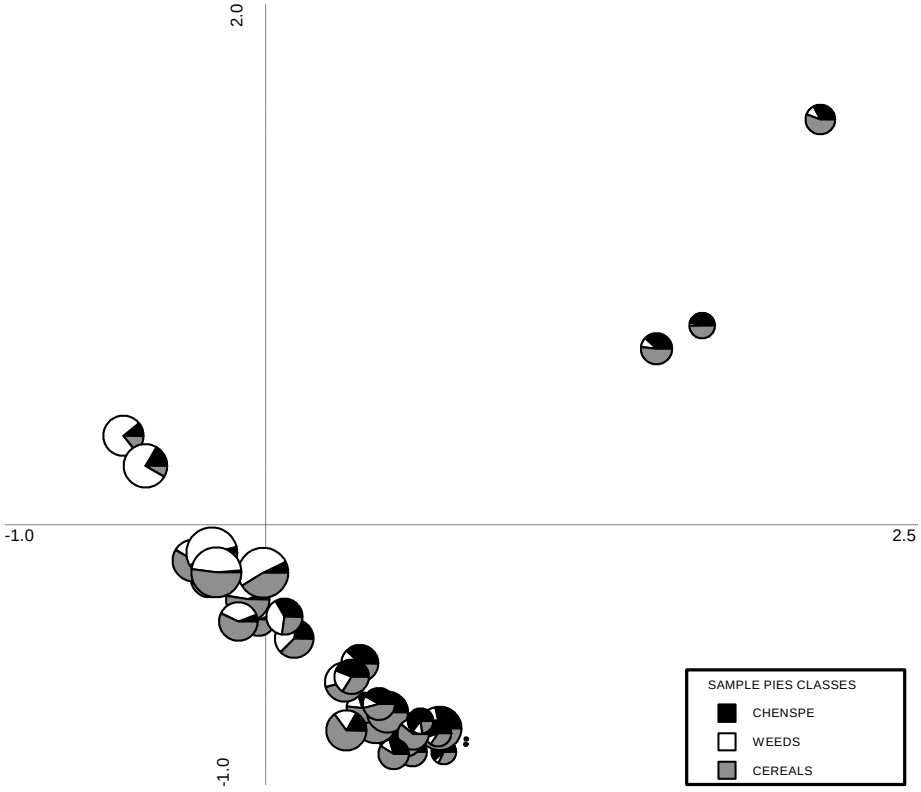


Fig 7.3. Unsieved products - Shannon diversity examining the impact of Chenopodium on sample composition: LBA Feudvar.

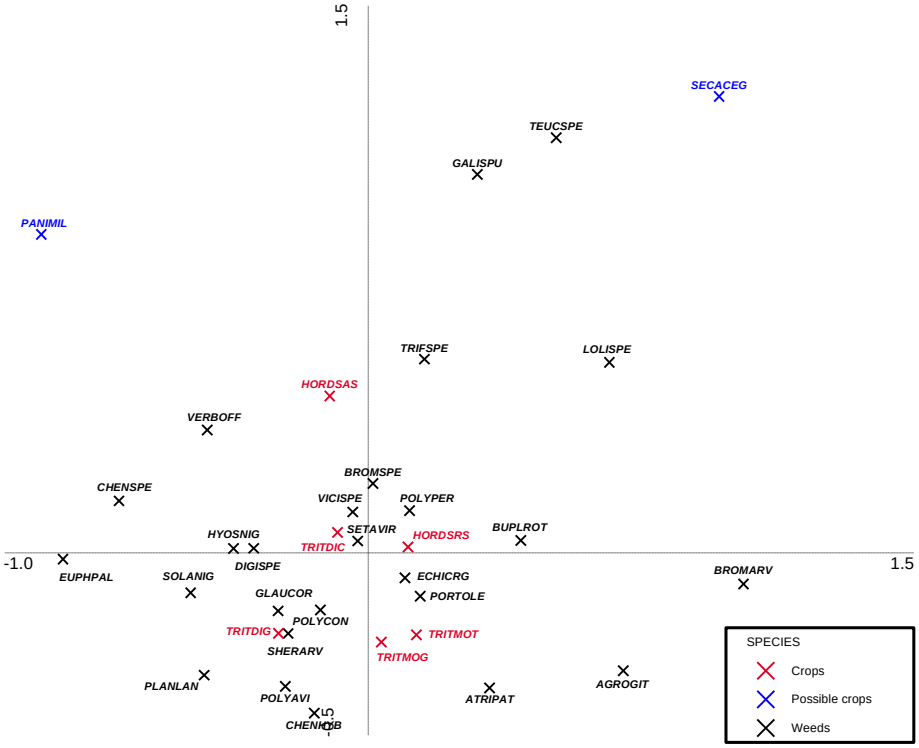


Fig 7.4. Correspondence analysis of crops, possible crops and weed species for samples identified as unsieved spikelets on the first two principal axes (axis 1 horizontal, axis 2 vertical): LBA Feudvar

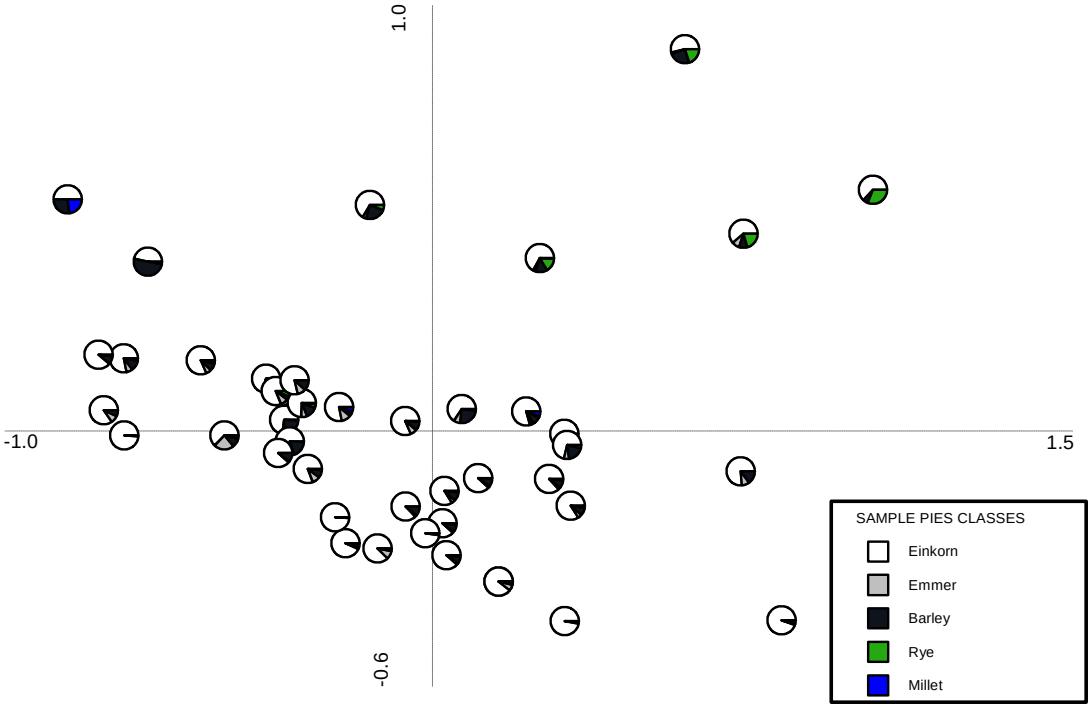


Fig 7.5. Correspondence analysis of the proportion of cereals per sample identified as unsieved spikelets: LBA Feudvar

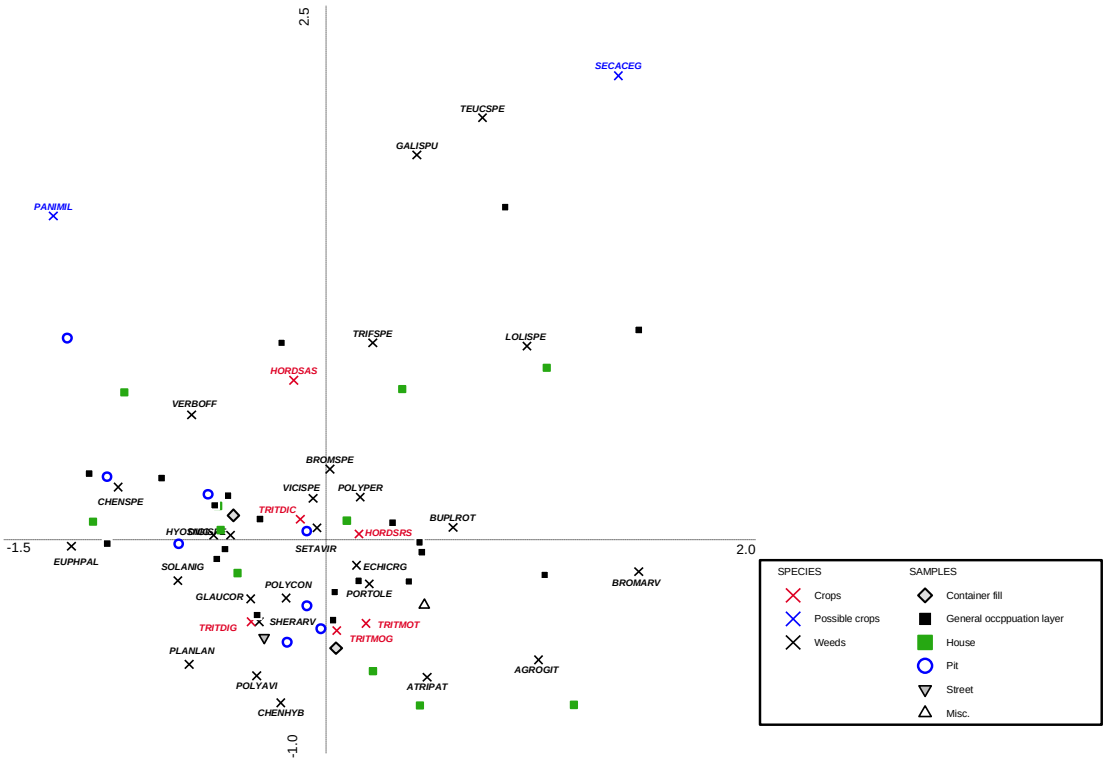


Fig 7.6. Correspondence analysis of crops, possible crops and weed species for samples identified as unsieved spikelets per feature type: LBA Feudvar

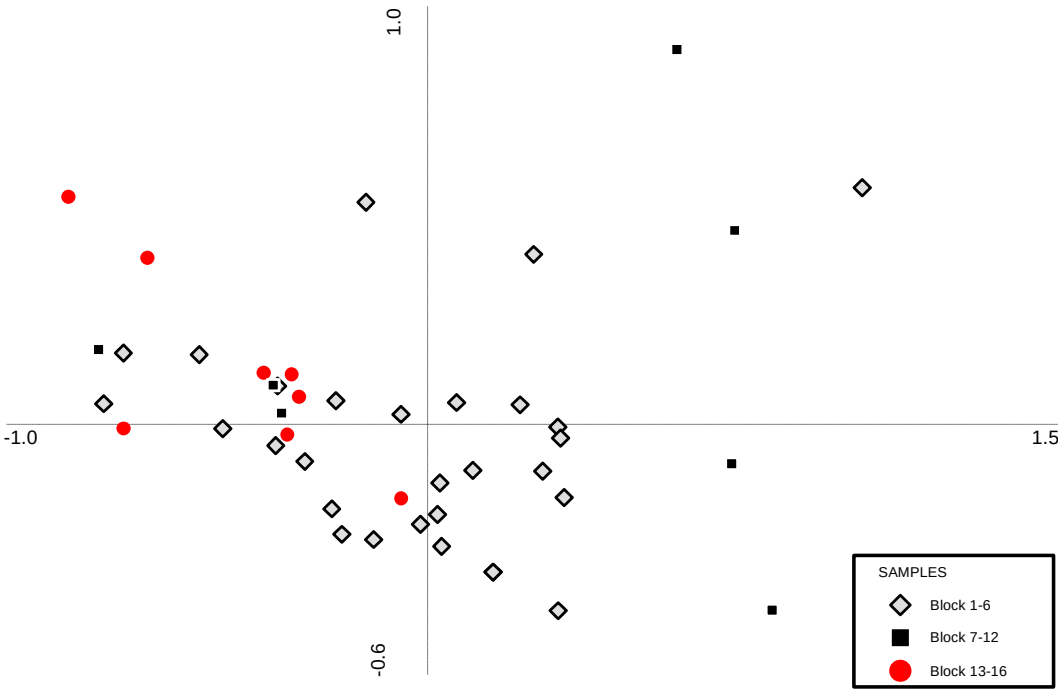


Fig 7.7. Correspondence analysis of each sample identified as unsieved spikelets per block group: LBA Feudvar

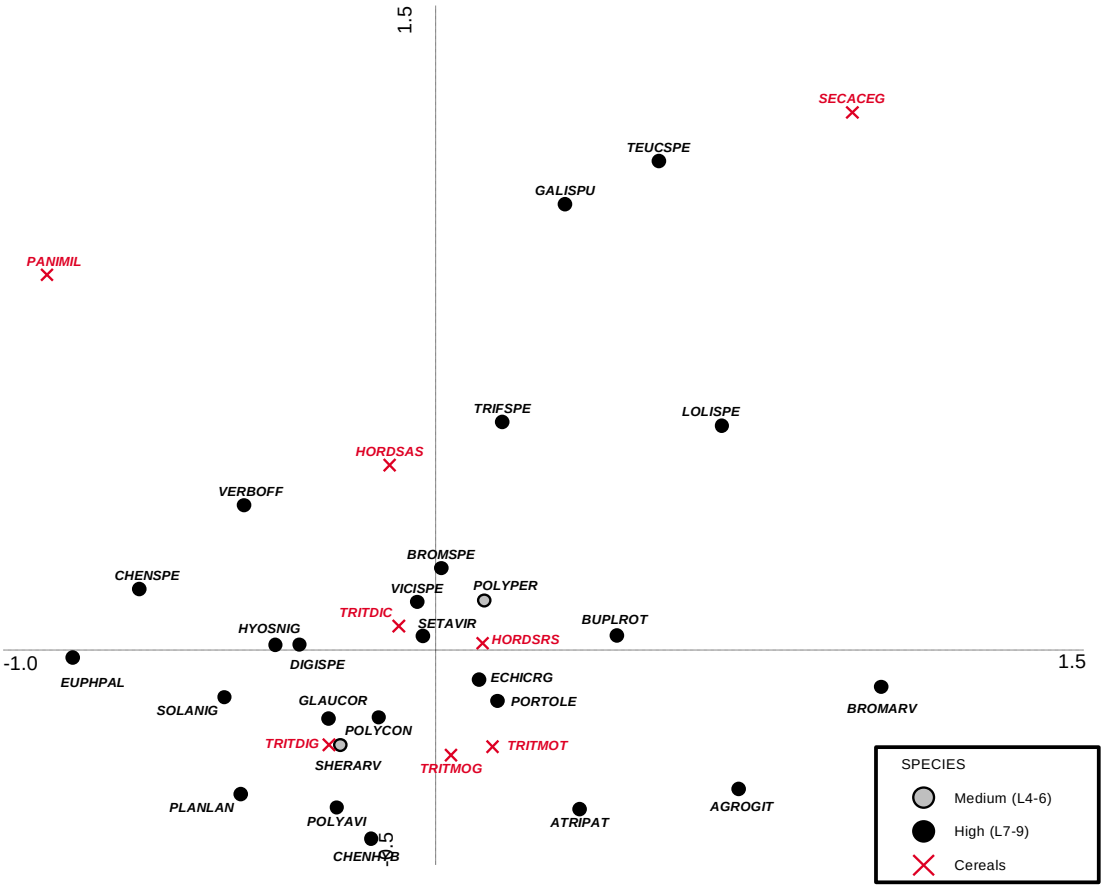


Fig 7.8. Correspondence analysis of crops and weed species for samples identified as unsieved spikelets showing the ecological indicator values for light (after Borhidi 1995): LBA Feudvar

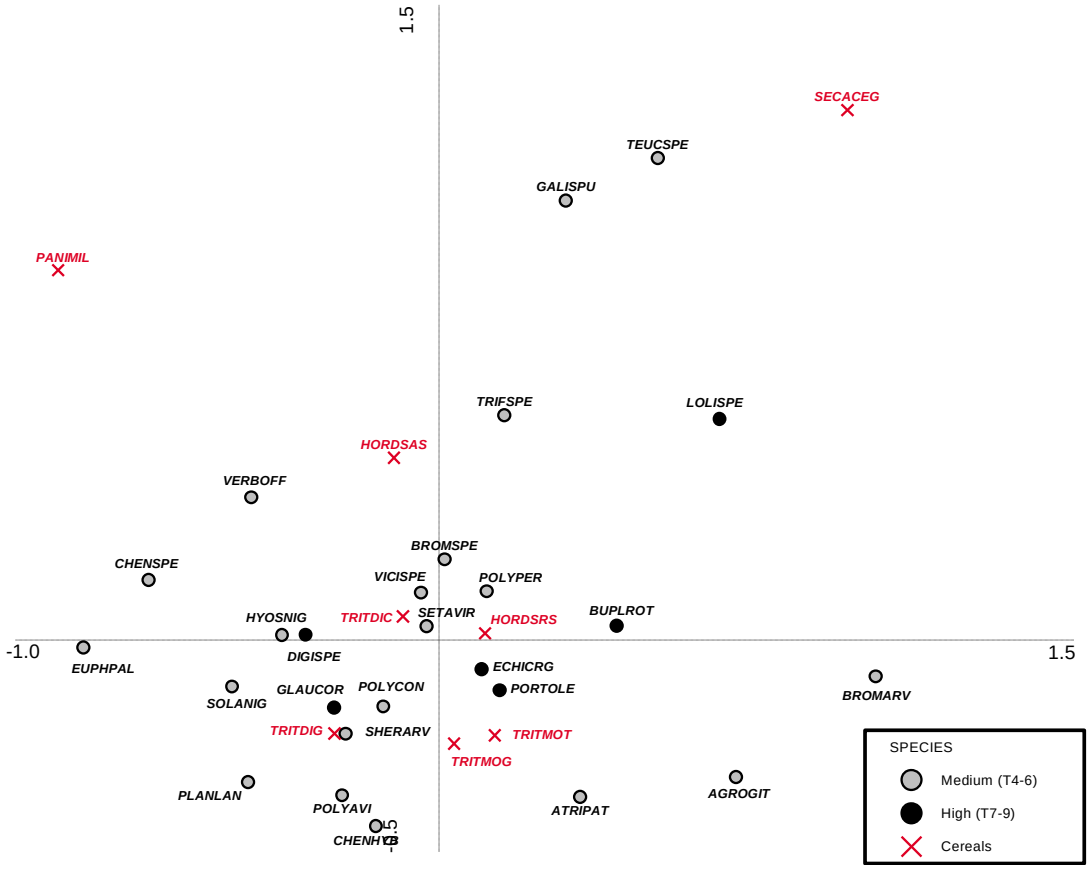


Fig 7.9. Correspondence analysis of crops and weed species for samples identified as unsieved spikelets showing the ecological indicator values for temperature (after Borhidi 1995): LBA Feudvar

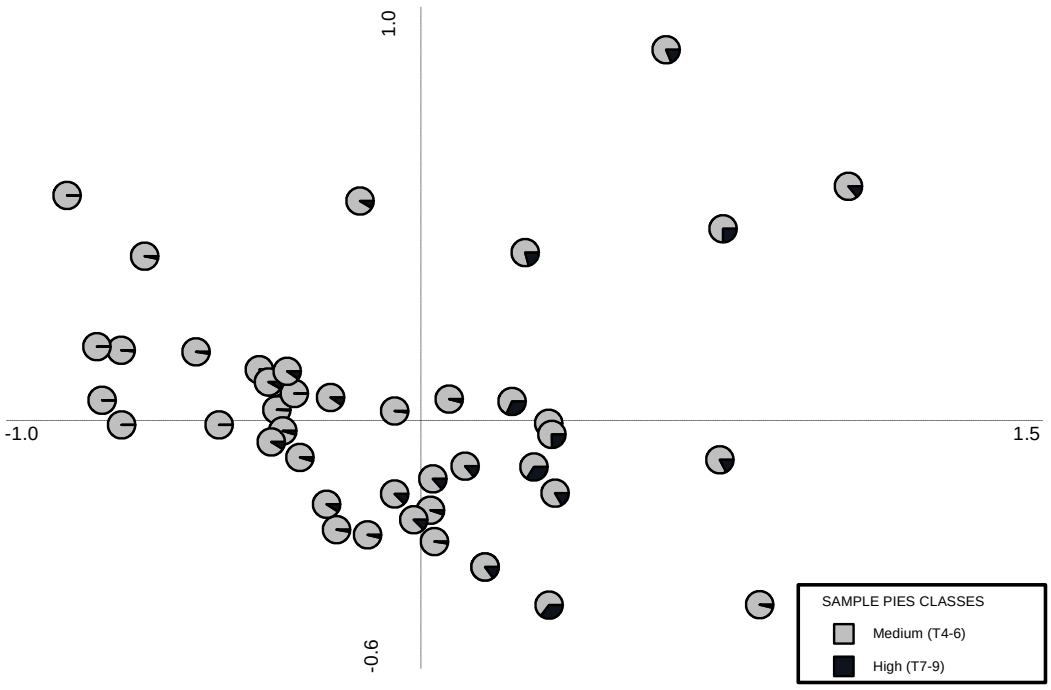


Fig 7.10. Correspondence analysis of the proportion of weed species according to their temperature indicator value for samples identified as unsieved spikelets (after Borhidi 1995): LBA Feudvar

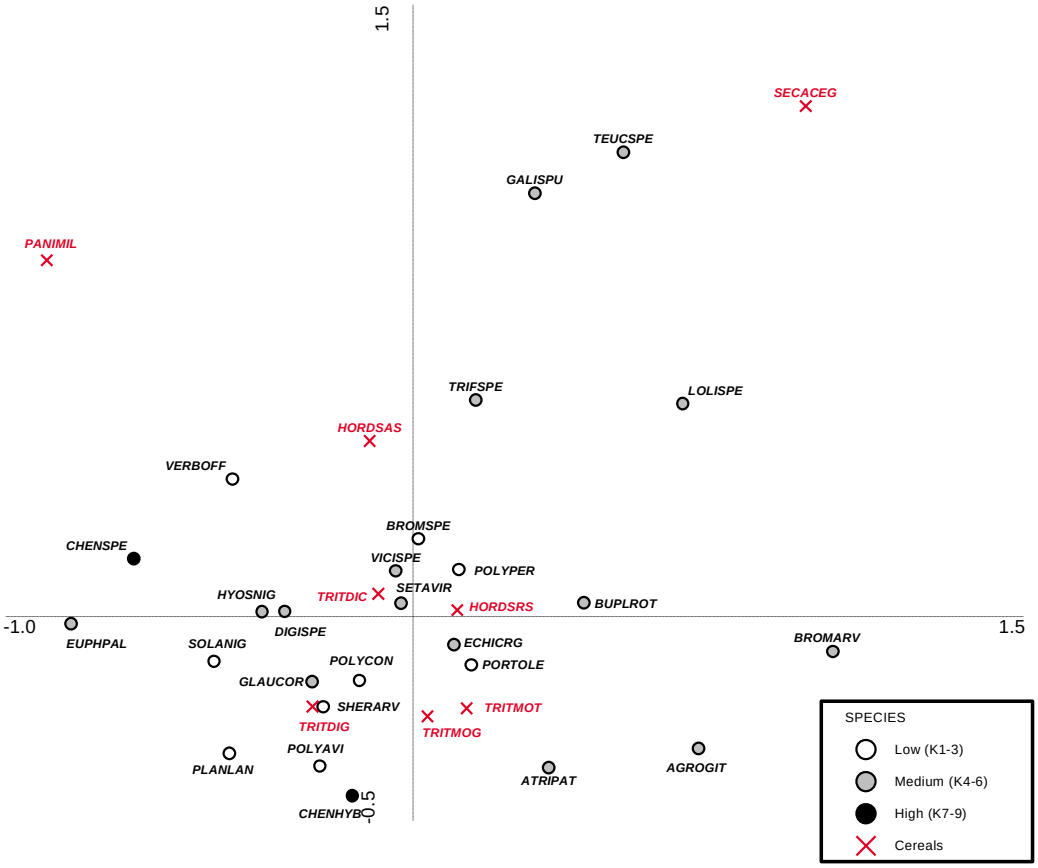


Fig 7.11. Correspondence analysis of crops and weed species for samples identified as unsieved spikelets showing the ecological indicator values for continentality (after Borhidi 1995): LBA Feudvar

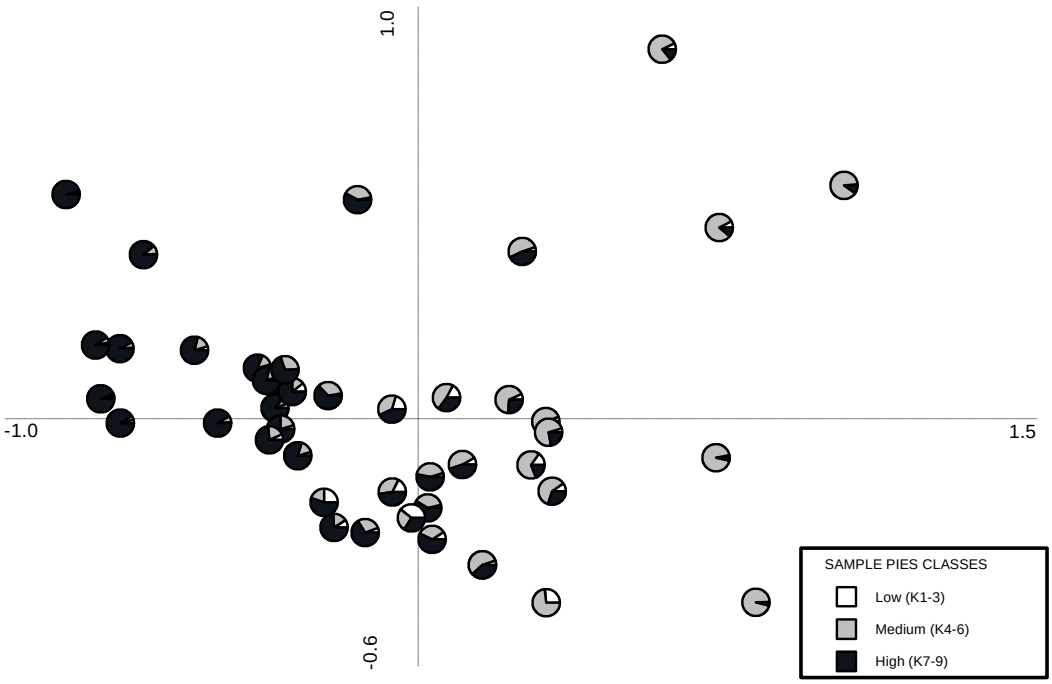


Fig 7.12. Correspondence analysis of the proportion of weed species according to their continentality indicator value for samples identified as unsieved spikelets (after Borhidi 1995): LBA Feudvar

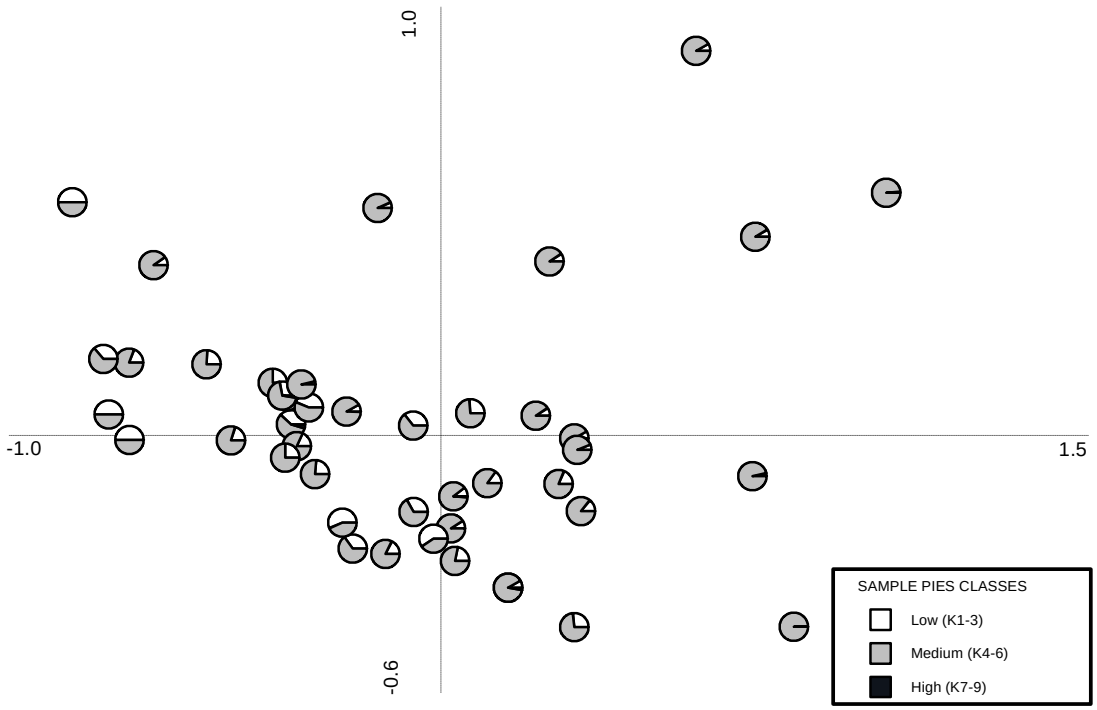


Fig 7.13. Correspondence analysis of the proportion of weed species without CHENSPE according to their continentality indicator value for samples identified as unsieved spikelets (after Borhidi 1995): LBA Feudvar

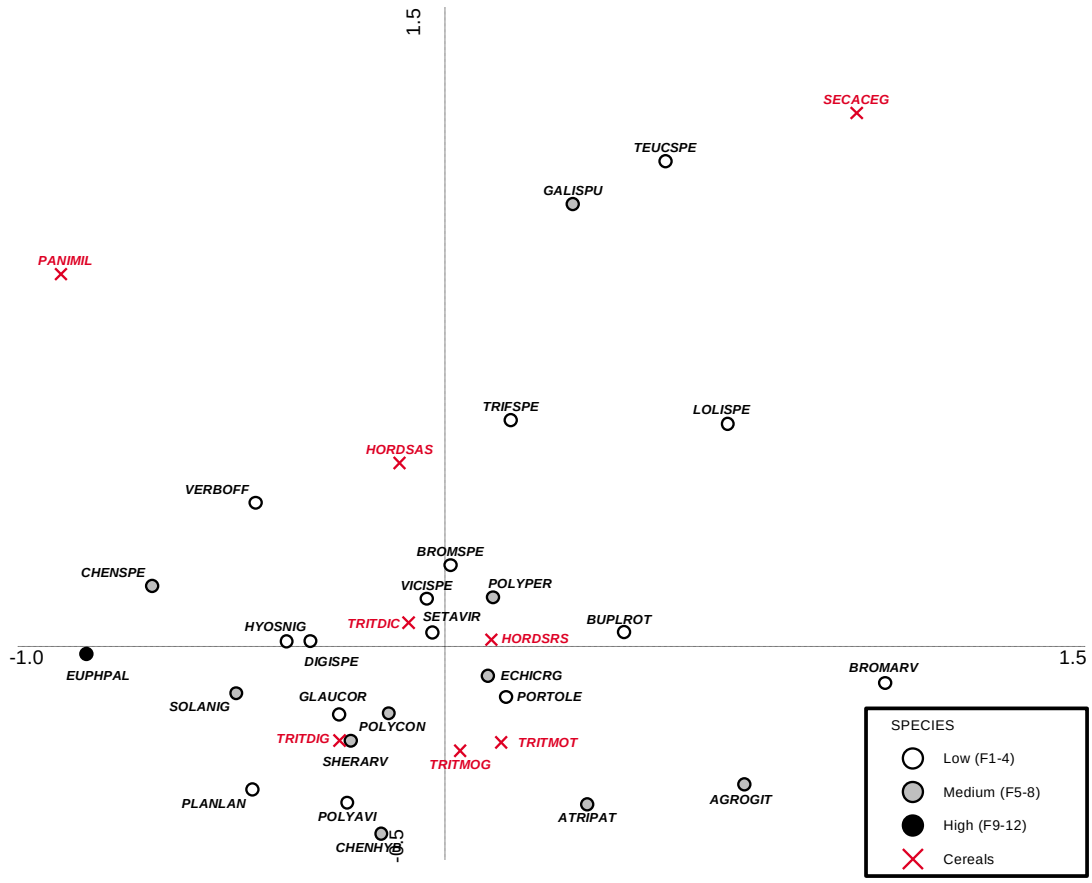


Fig 7.14. Correspondence analysis of crops and weed species for samples identified as unsieved spikelets showing the ecological indicator values for moisture (after Borhidi 1995): LBA Feudvar

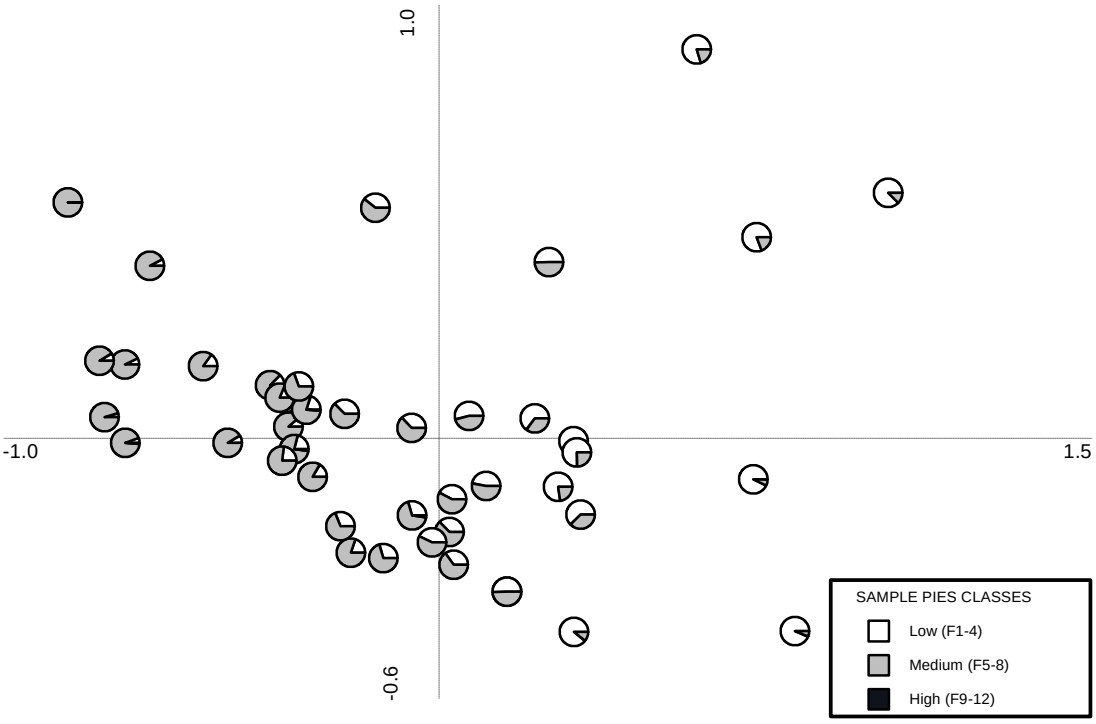


Fig 7.15. Correspondence analysis of the proportion of weed species according to their moisture indicator value for samples identified as unsieved spikelets (after Borhidi 1995): LBA Feudvar

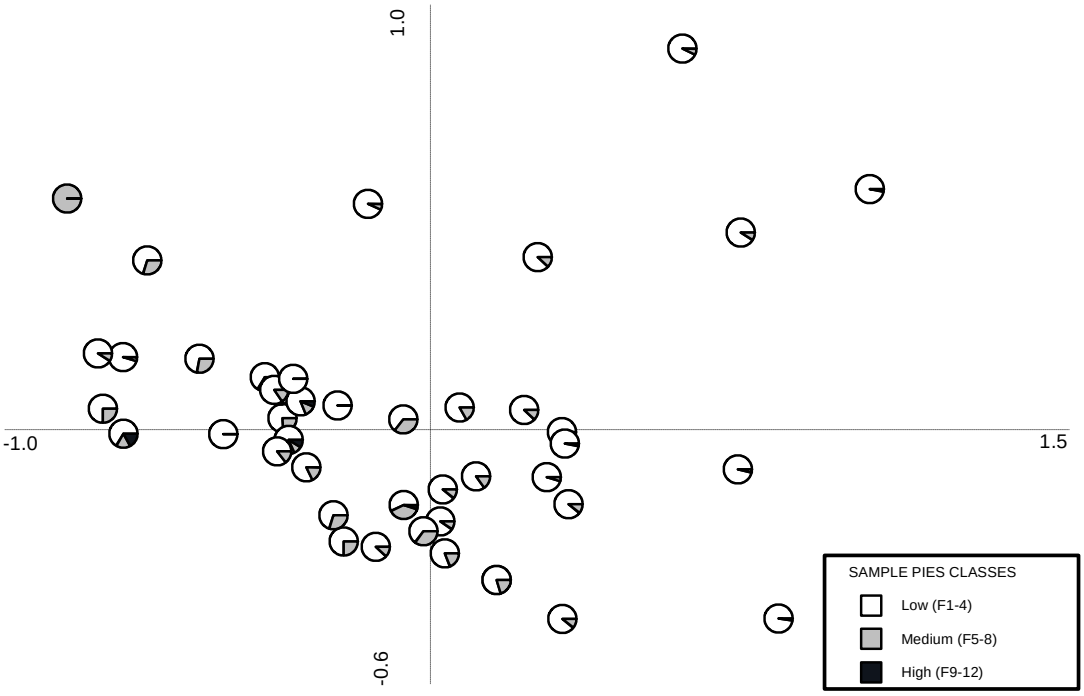


Fig 7.16. Correspondence analysis of the proportion of weed species without CHENSPE according to their moisture indicator value for samples identified as unsieved spikelets (after Borhidi 1995): LBA Feudvar

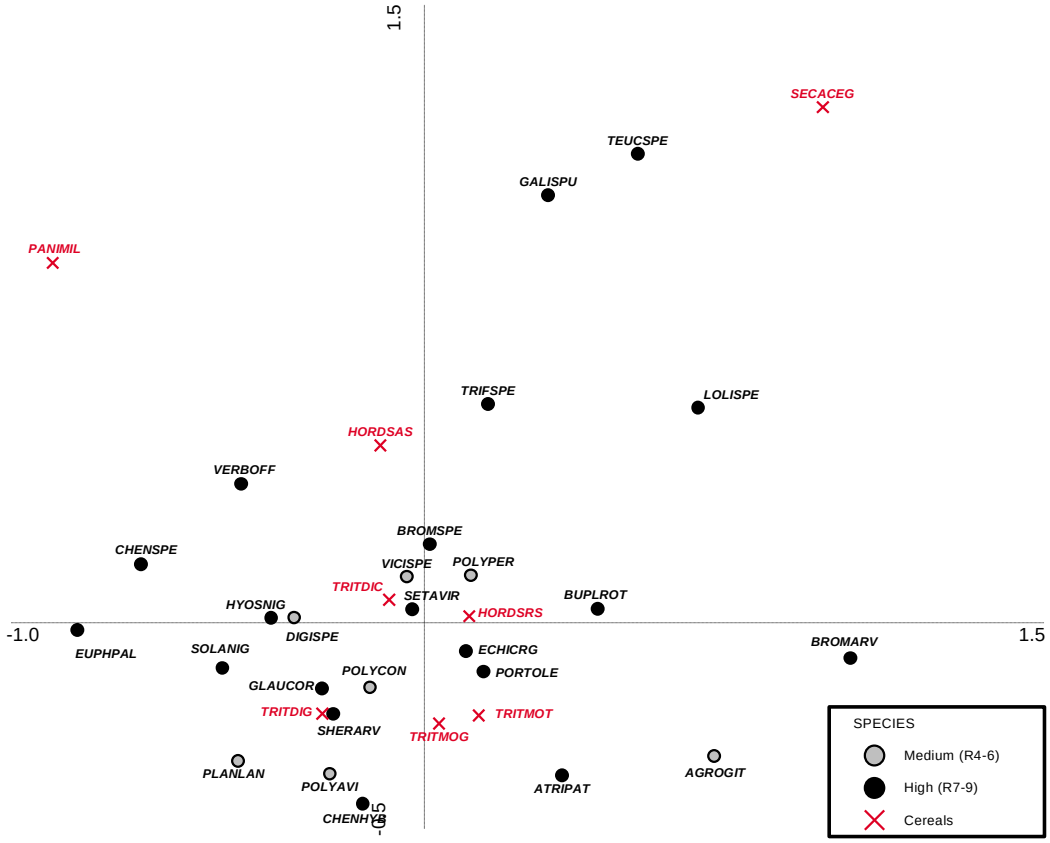


Fig 7.17. Correspondence analysis of crops and weed species for samples identified as unsieved spikelets showing the ecological indicator values for reaction (after Borhidi 1995): LBA Feudvar

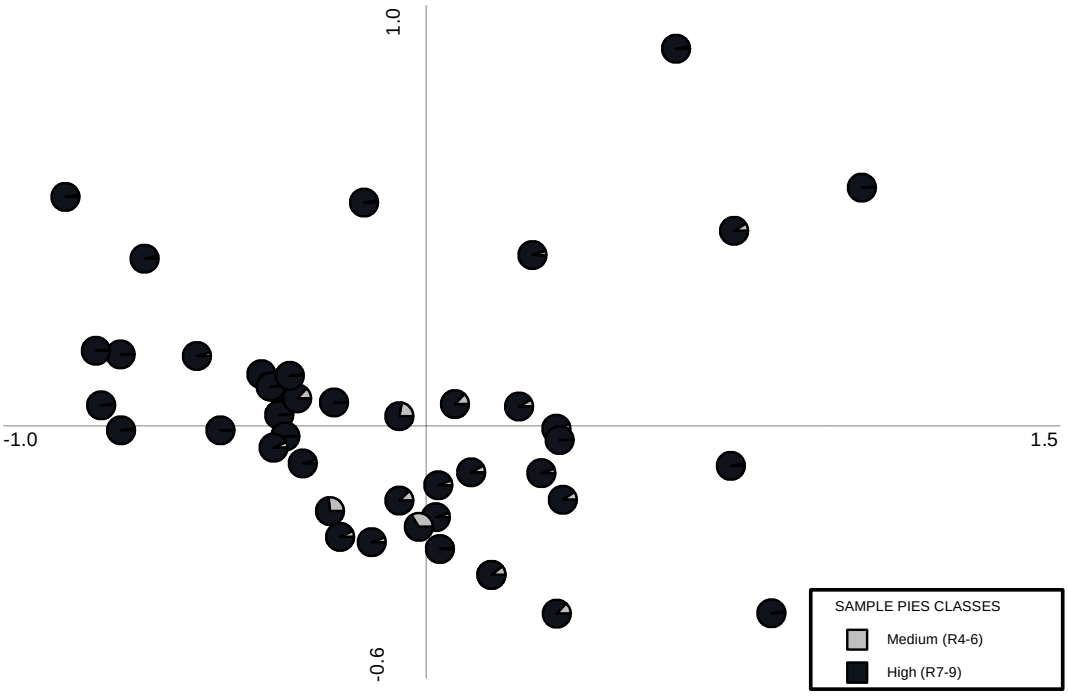


Fig 7.18. Correspondence analysis of the proportion of weed species according to their reaction indicator value for samples identified as unsieved spikelets (after Borhidi 1995): LBA Feudvar

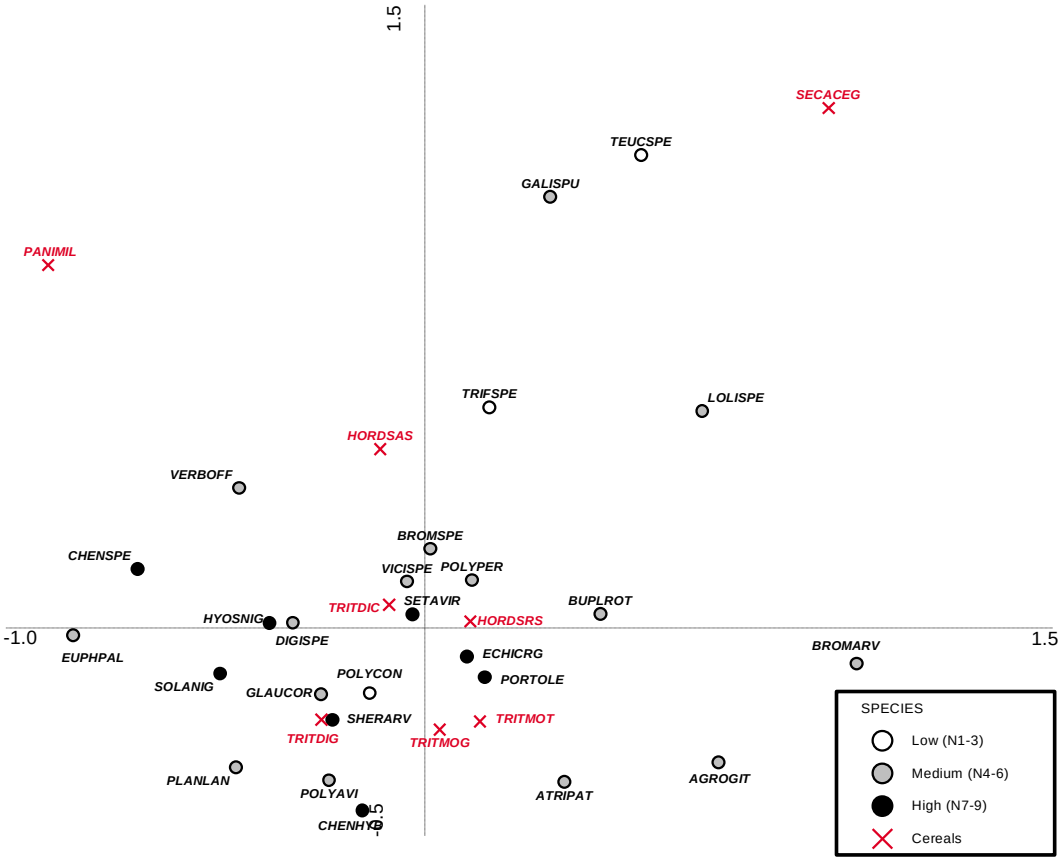


Fig 7.19. Correspondence analysis of crops and weed species for samples identified as unsieved spikelets showing the ecological indicator values for nitrogen (after Borhidi 1995): LBA Feudvar

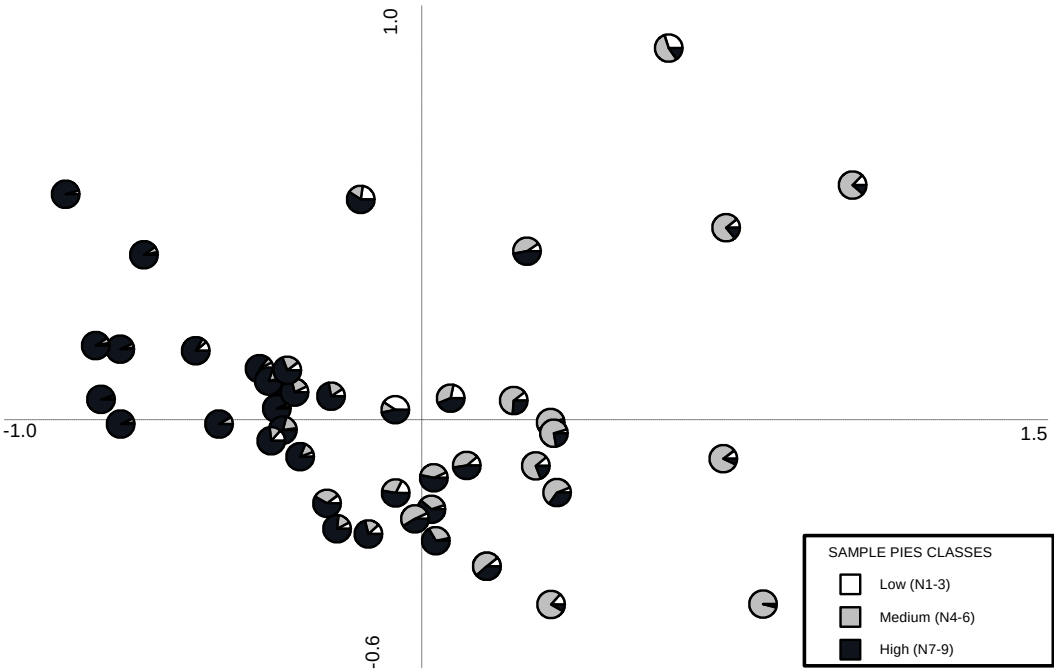


Fig 7.20. Correspondence analysis of the proportion of weed species according to their nitrogen indicator value for samples identified as unsieved spikelets (after Borhidi 1995): LBA Feudvar

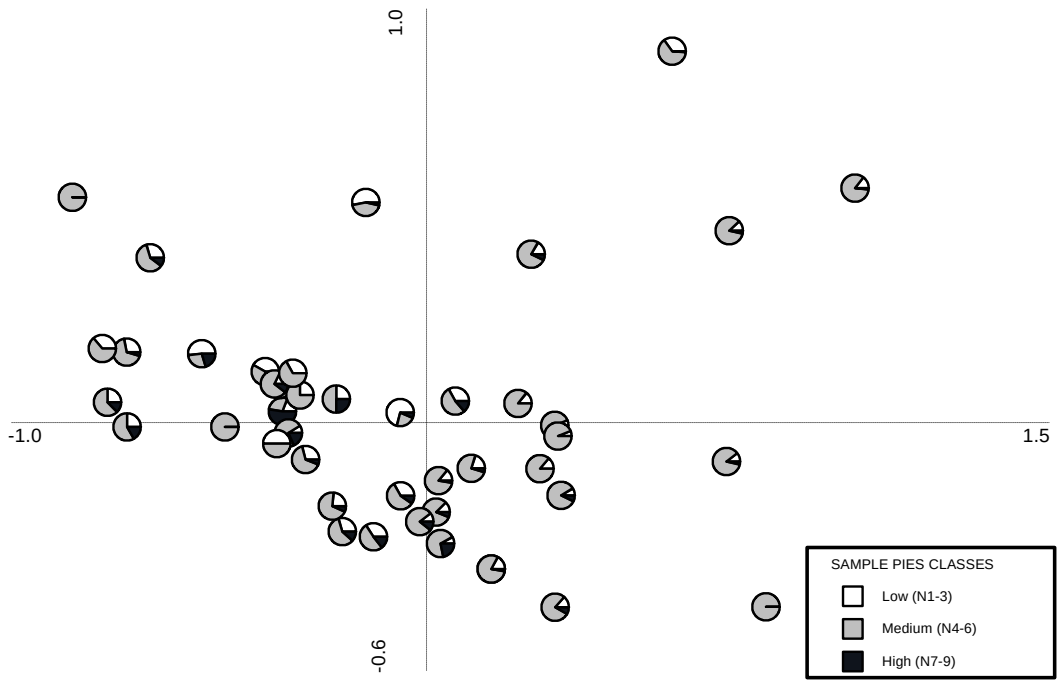


Fig 7.21. Correspondence analysis of the proportion of weed species without CHENSPE according to their nitrogen indicator value for samples identified as unsieved spikelets (after Borhidi 1995): LBA Feudvar

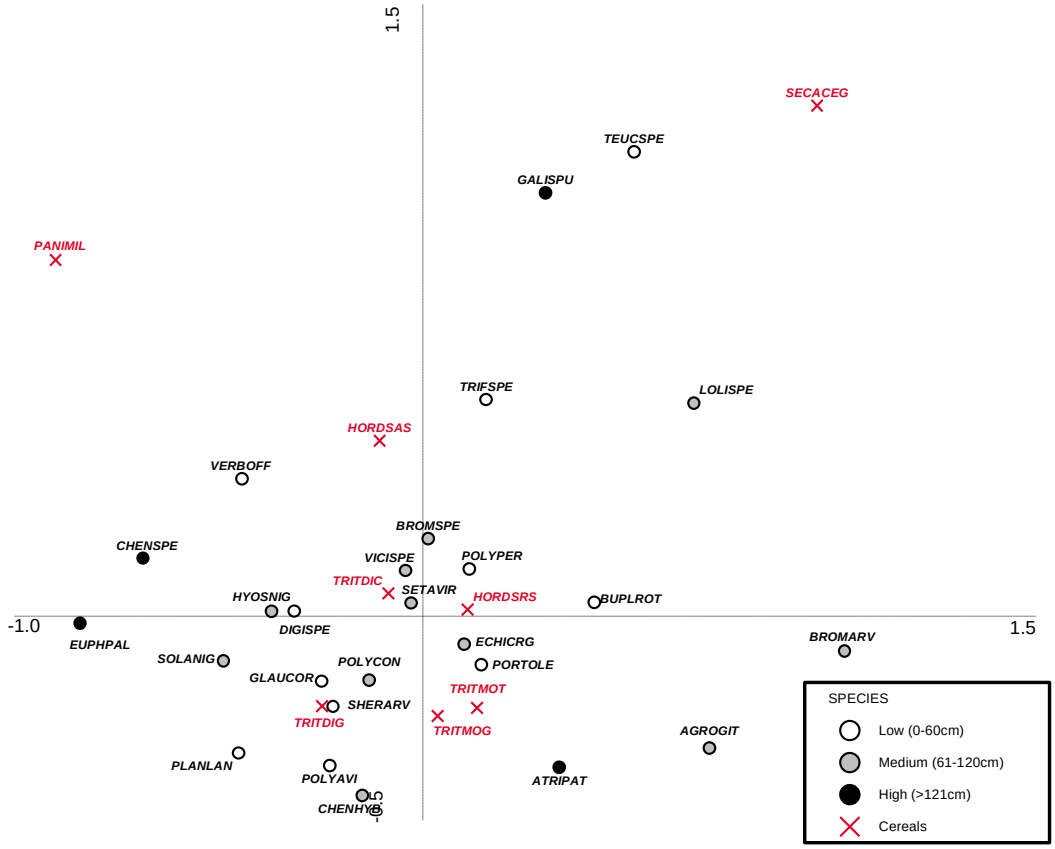


Fig 7.22. Correspondence analysis of crops and weed species for samples identified as unsieved spikelets showing the maximum flowering height for each weed (after Bojňanský and Fargašová 2007): LBA Feudvar

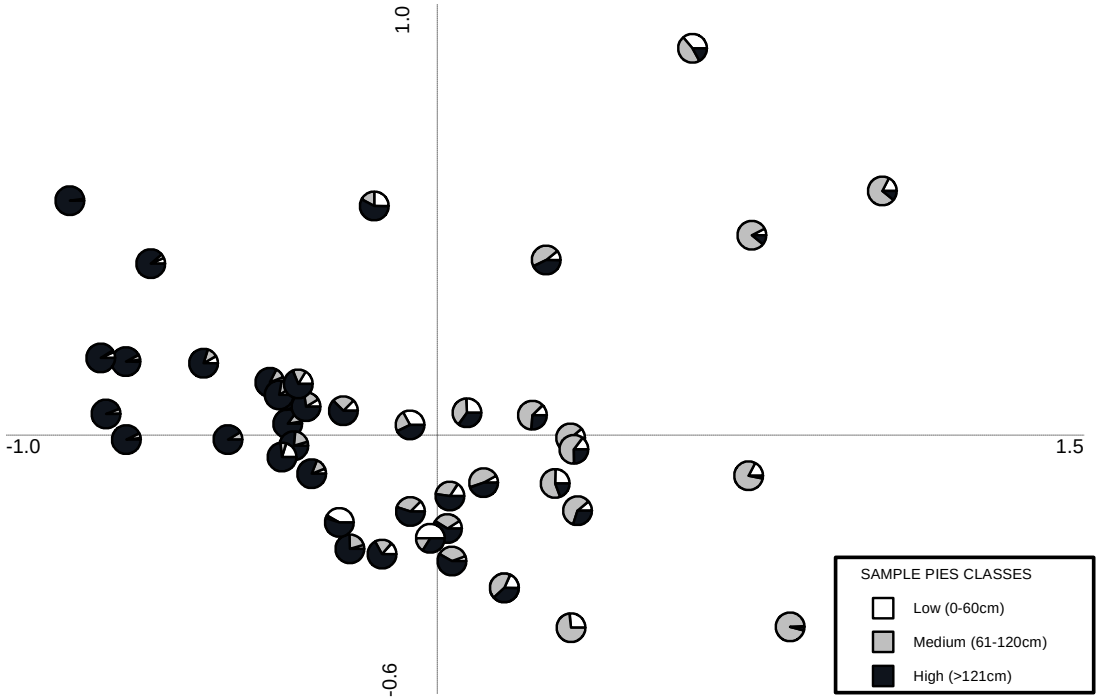


Fig 7.23. Correspondence analysis showing the proportions of weed species according to their maximum flowering height for samples identified as unsieved spikelets (after Bojňanský and Fargašová 2007): LBA Feudvar

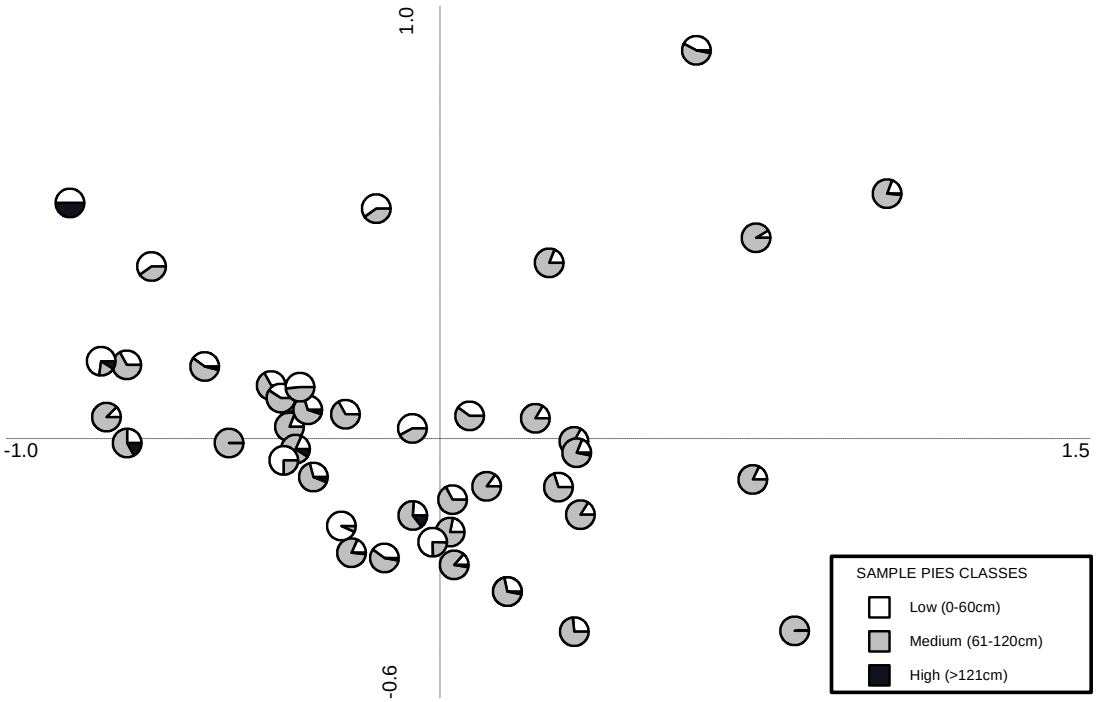


Fig 7.24. Correspondence analysis showing the proportions of weed species without CHENSPE according to their maximum flowering height for samples identified as unsieved spikelets (after Bojňanský and Fargašová 2007): LBA Feudvar

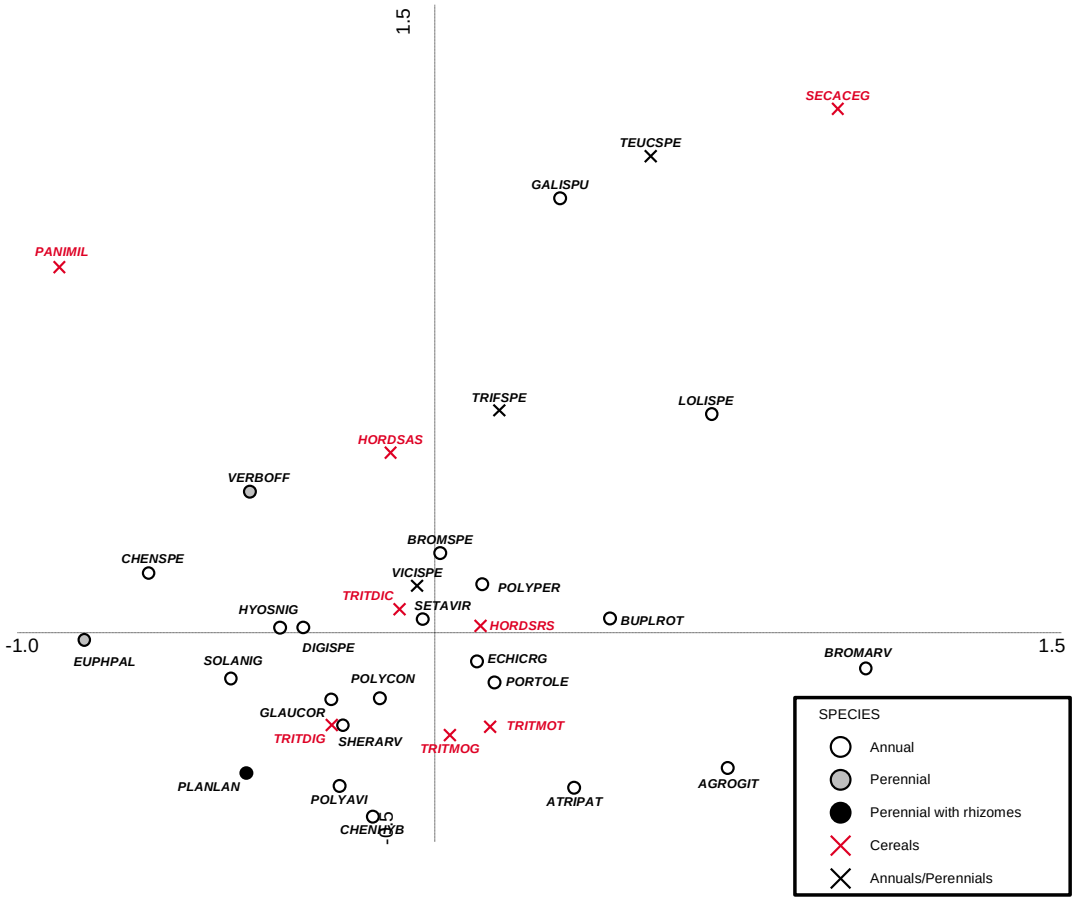


Fig 7.25. Correspondence analysis of crops and weed species for samples identified as unsieved spikelets showing the life cycle of each weed i.e. whether they are an annual, perennial with or without rhizomes (after Bojňanský and Fargašová 2007): LBA Feudvar

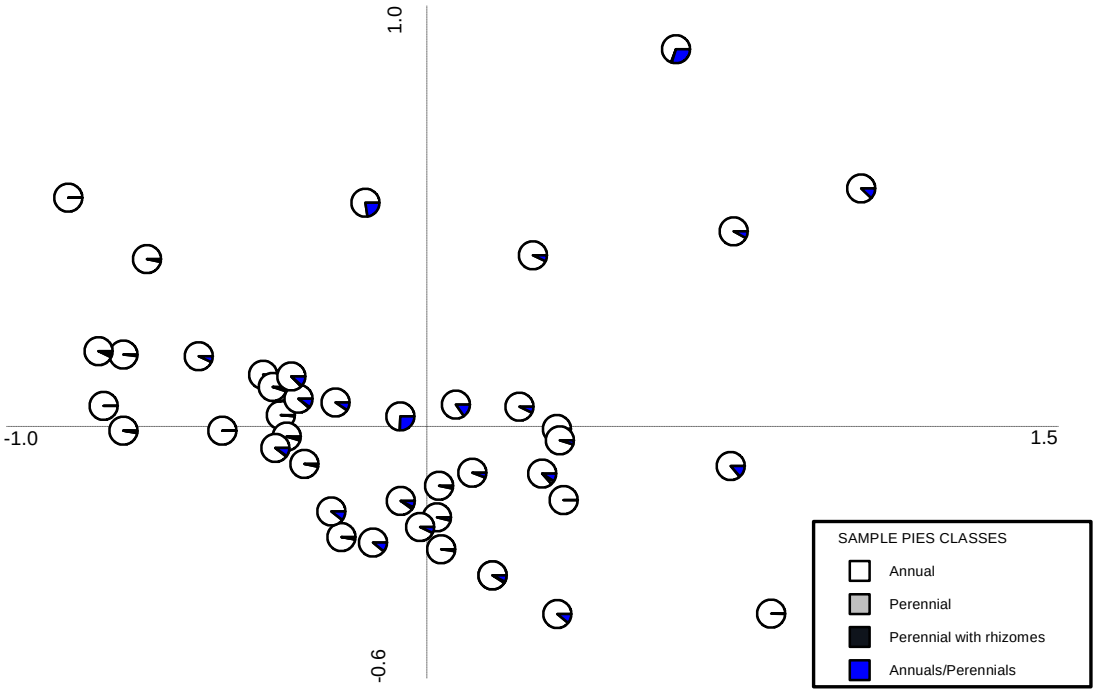


Fig 7.26. Correspondence analysis showing proportions of annuals and perennials for samples identified as unsieved spikelets spikelets (after Bojňanský and Fargašová 2007): LBA Feudvar

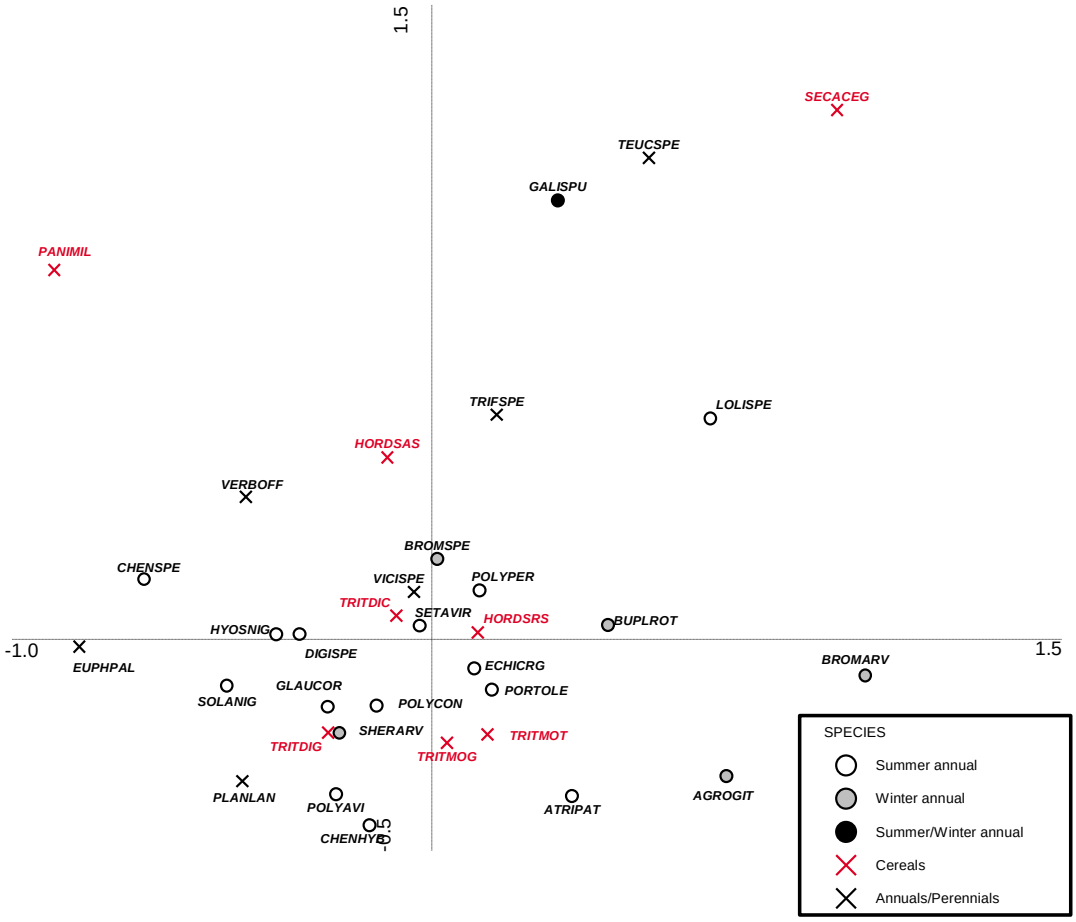


Fig 7.27. Correspondence analysis of crops and weed species for samples identified as unsieved spikelets showing the germination time of each weed (after Bojňanský and Fargašová 2007): LBA Feudvar

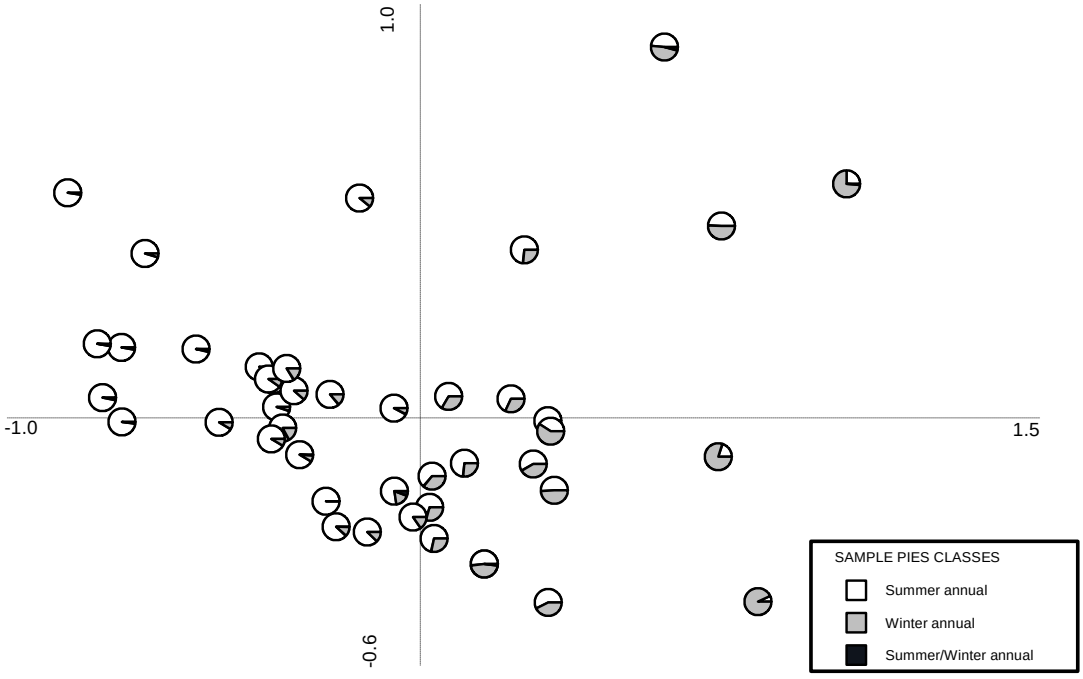


Fig 7.28. Correspondence analysis showing proportions of summer and winter annuals for samples identified as unsieved spikelets (after Bojňanský and Fargašová 2007): LBA Feudvar

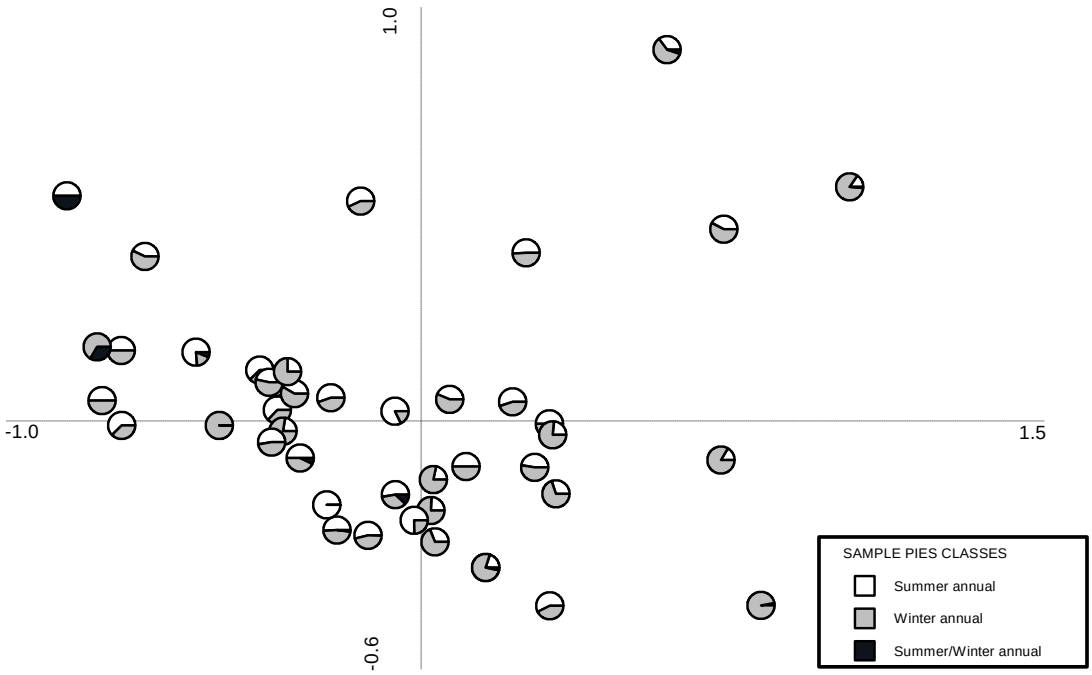


Fig 7.29. Correspondence analysis showing proportions of summer and winter annuals without CHENSPE for samples identified as unsieved spikelets (after Bojňanský and Fargašová 2007): LBA Feudvar

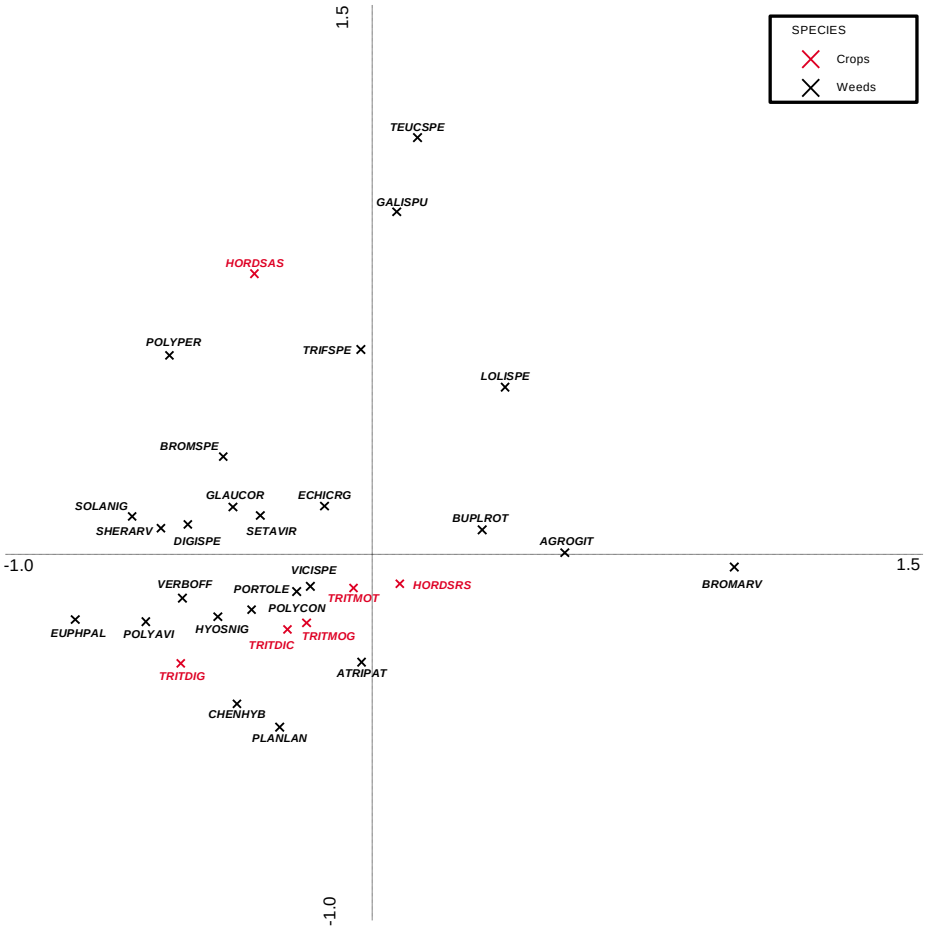


Fig 7.30. Correspondence analysis of crops, possible crops and weed species, without CHENSPE, SECACEG AND PANMIL, for samples identified as unsieved spikelets: LBA Feudvar

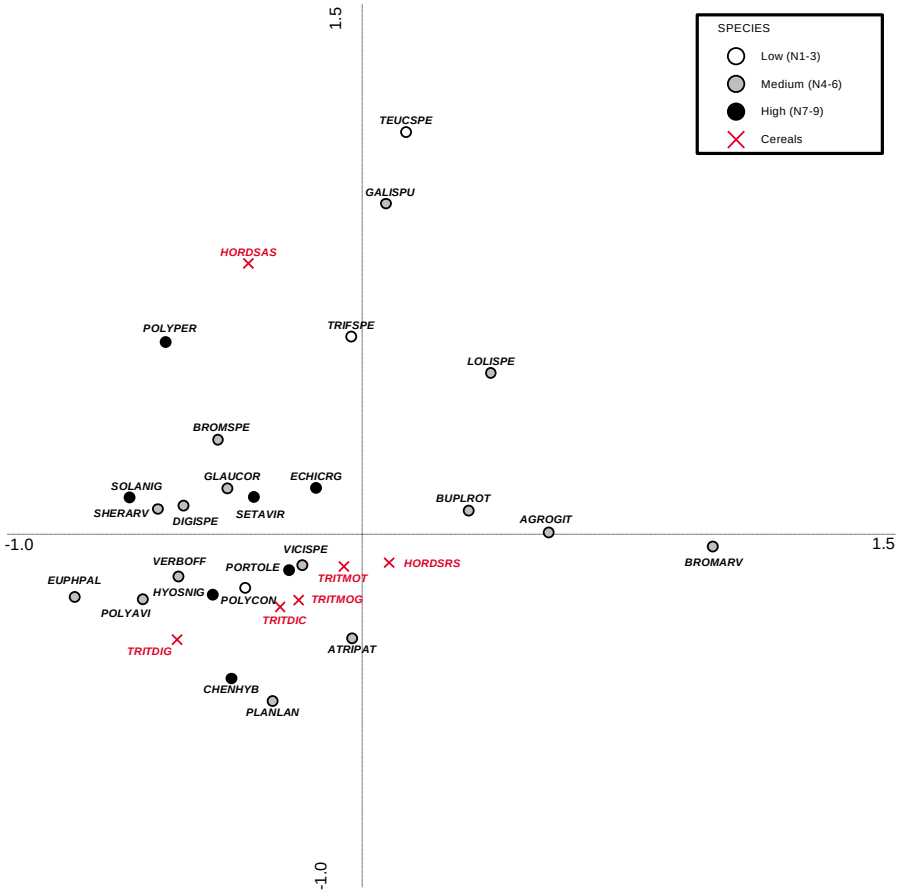


Fig 7.31. Correspondence analysis of crops and weed species, without CHENSPE, SECACEG AND PANMIL, for samples identified as unsieved spikelets showing the ecological indicator values for nitrogen (after Borhidi 1995): LBA Feudvar

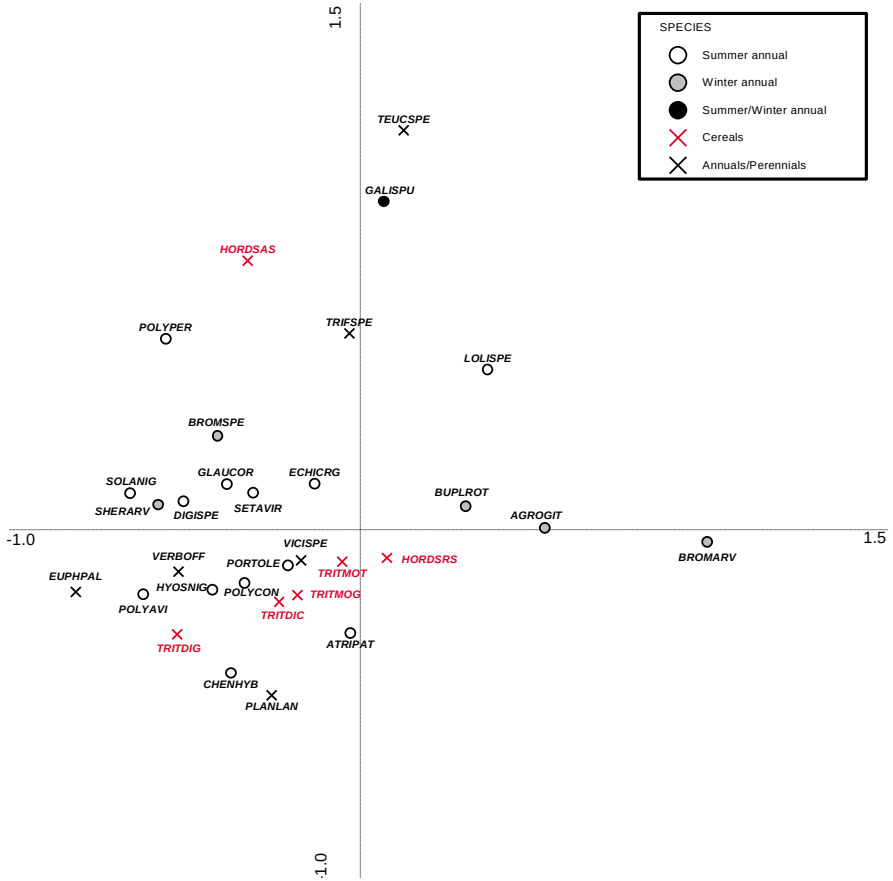


Fig 7.32. Correspondence analysis of crops and weed species, without CHENSPE, SECACEG AND PANMIL, for samples identified as unsieved spikelets showing the germination time of each weed (after Bojňanský and Fargašová 2007): LBA Feudvar

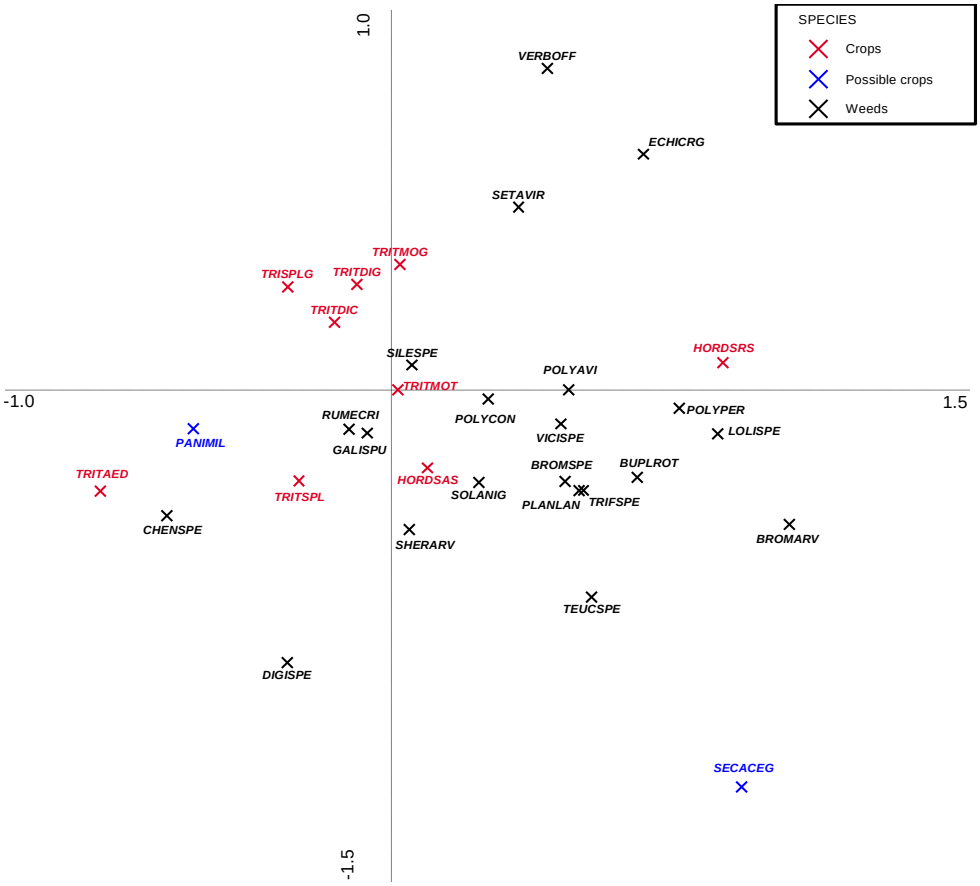
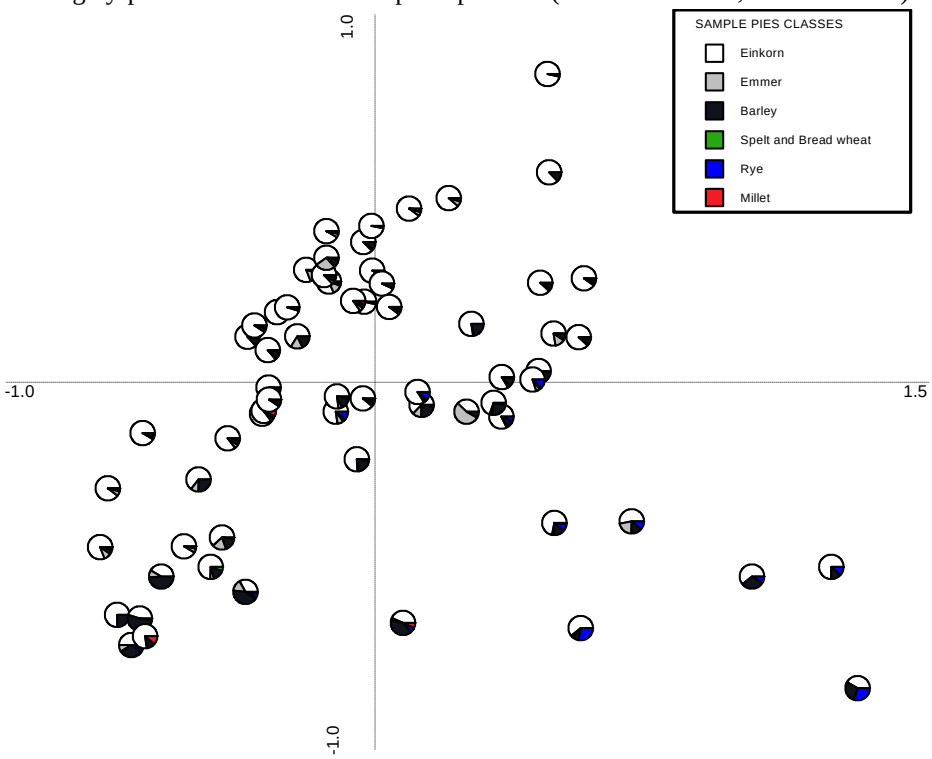


Fig 7.33. Correspondence analysis of crops, possible crops and weed species for samples identified as unsieved fine sieving by-products on the first two principal axes (axis 1 horizontal, axis 2 vertical):



LBA Feudvar

Fig 7.34. Correspondence analysis of the proportion of cereals per sample identified as unsieved fine sieving by-products: LBA Feudvar

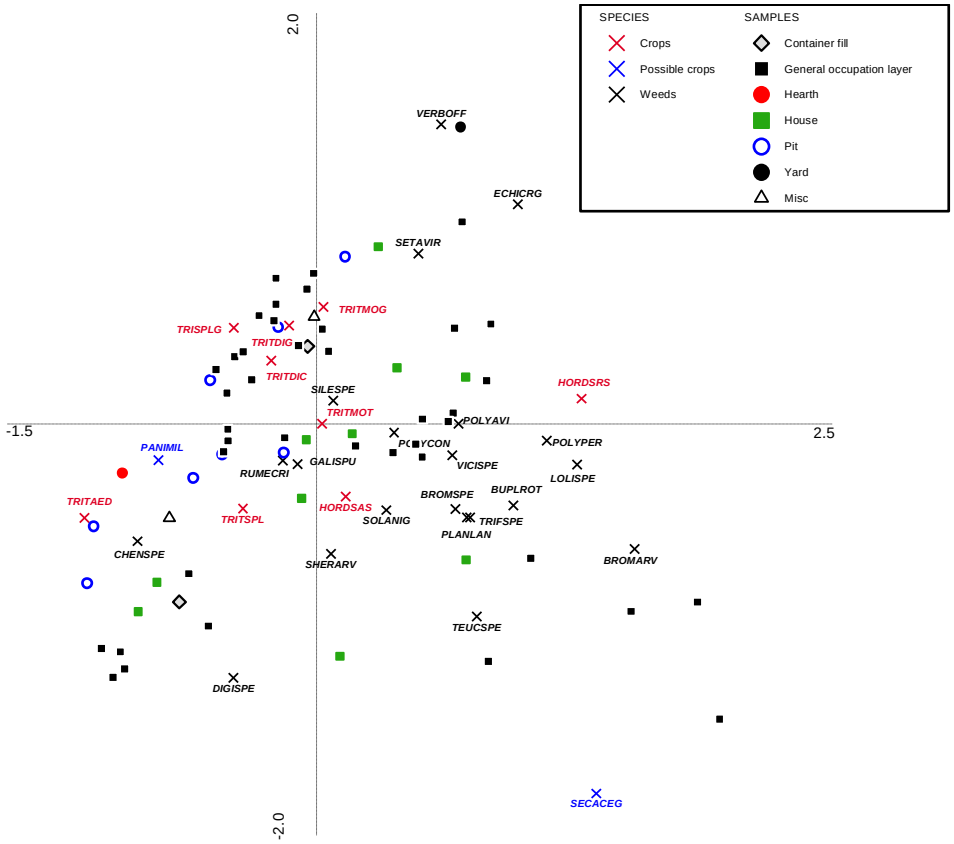


Fig 7.35. Correspondence analysis of crops, possible crops and weed species for samples identified as unsieved fine sieving by-products per feature type: LBA Feudvar

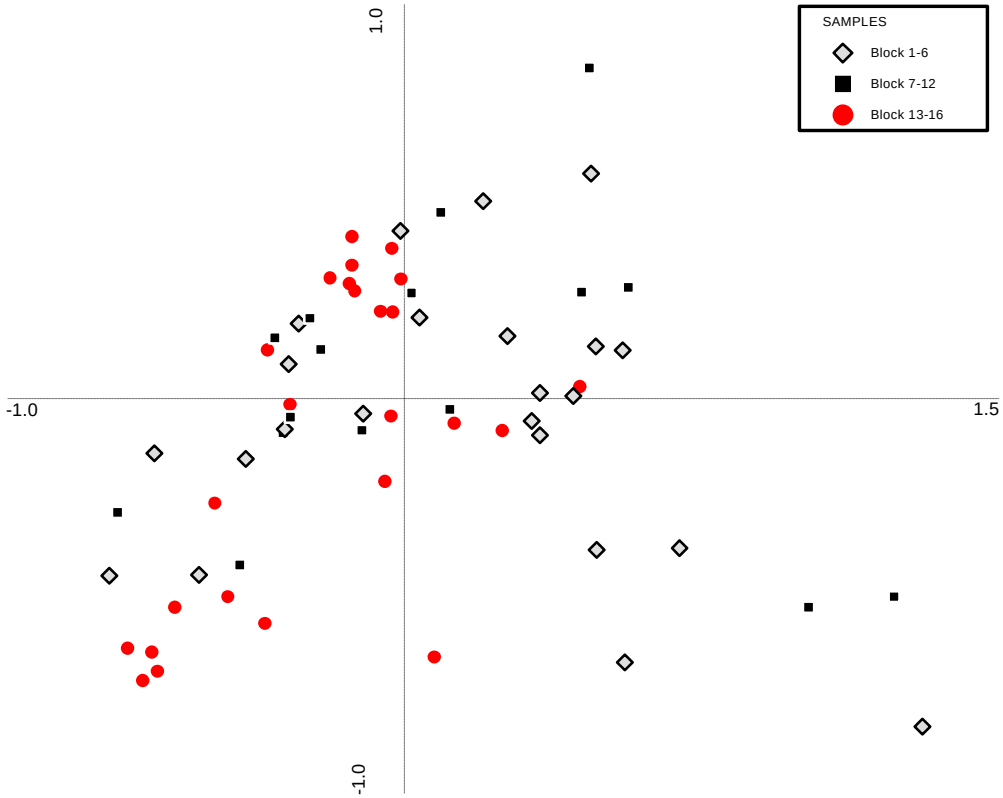


Fig 7.36. Correspondence analysis of each sample identified as unsieved fine sieving by-product per block group: LBA Feudvar

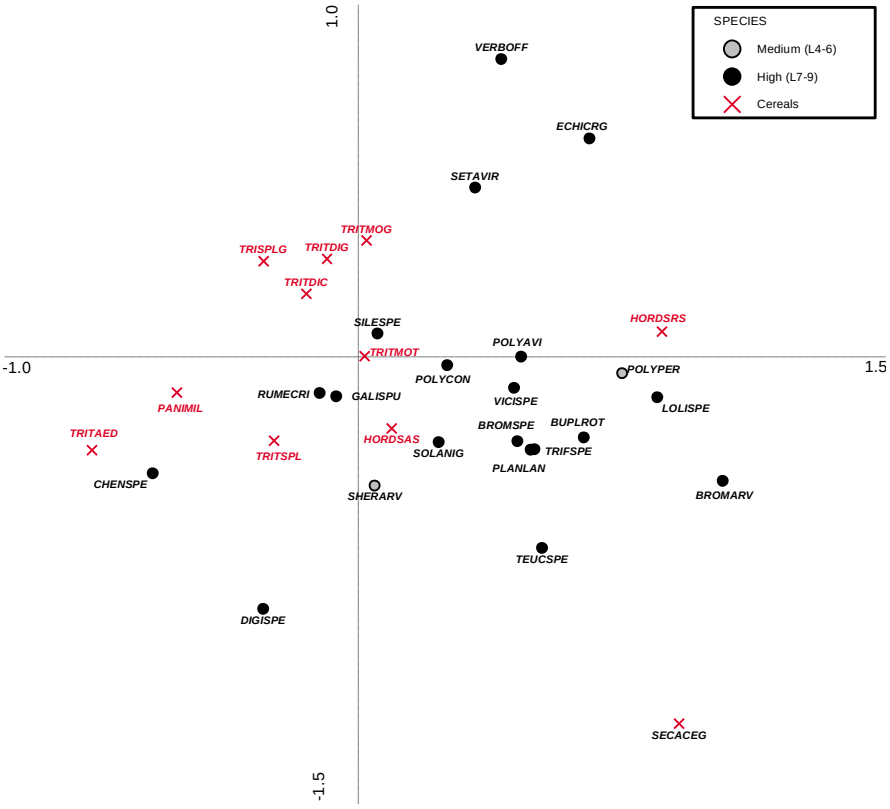


Fig 7.37. Correspondence analysis of crops and weed species for samples identified as unsieved fine sieving by-products showing the ecological indicator values for light (after Borhidi 1995): LBA Feudvar

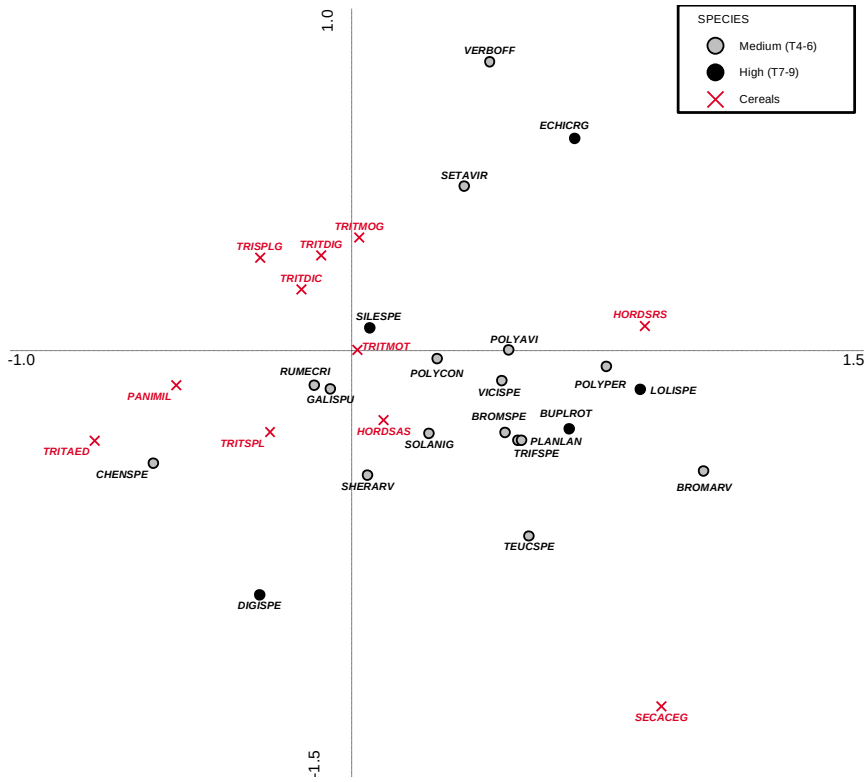


Fig 7.38. Correspondence analysis of crops and weed species for samples identified as unsieved fine sieving by-products showing the ecological indicator values for temperature (after Borhidi 1995): LBA Feudvar

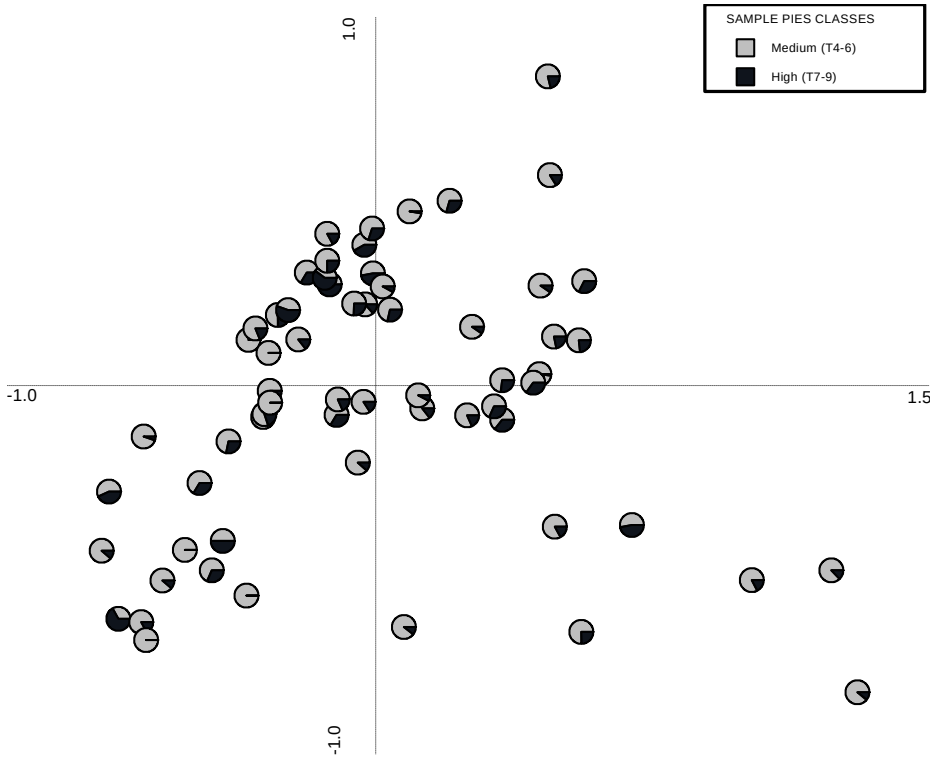


Fig 7.39. Correspondence analysis of crops and weed species without CHENSPE for samples identified as unsieved fine sieving by-products showing the ecological indicator values for temperature (after Borhidi 1995): LBA Feudvar

Fig 7.40. Correspondence analysis of crops and weed species for samples identified as unsieved fine sieving by-products showing the ecological indicator values for continentality (after Borhidi 1995): LBA Feudvar

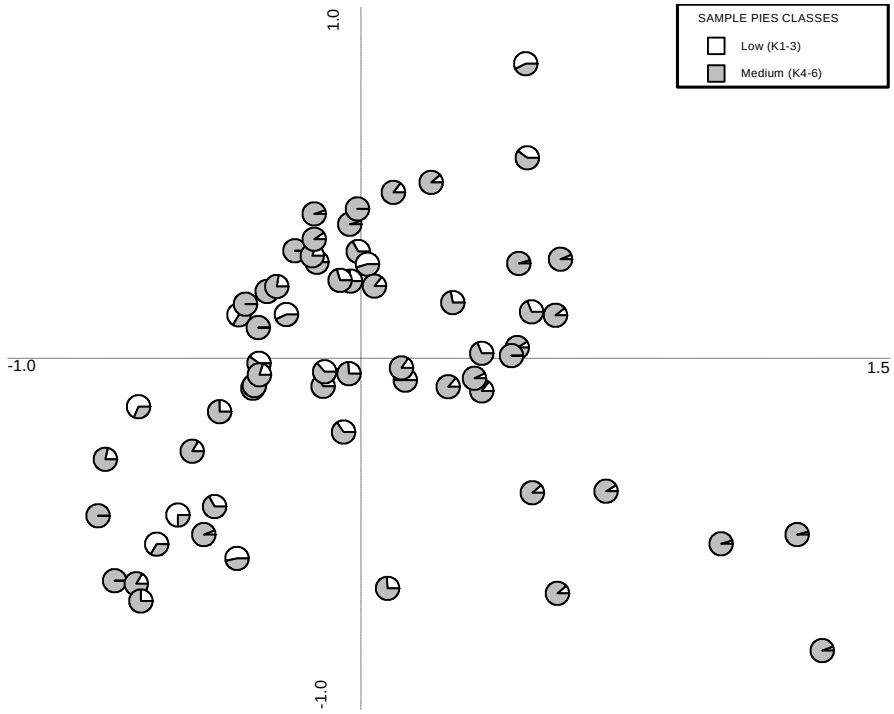


Fig 7.41. Correspondence analysis of crops and weed species without CHENSPE for samples identified as unsieved fine sieving by-products showing the ecological indicator values for continentality (after Borhidi 1995): LBA Feudvar

Fig 7.42. Correspondence analysis of crops and weed species for samples identified as unsieved fine sieving by-products showing the ecological indicator values for moisture (after Borhidi 1995): LBA Feudvar

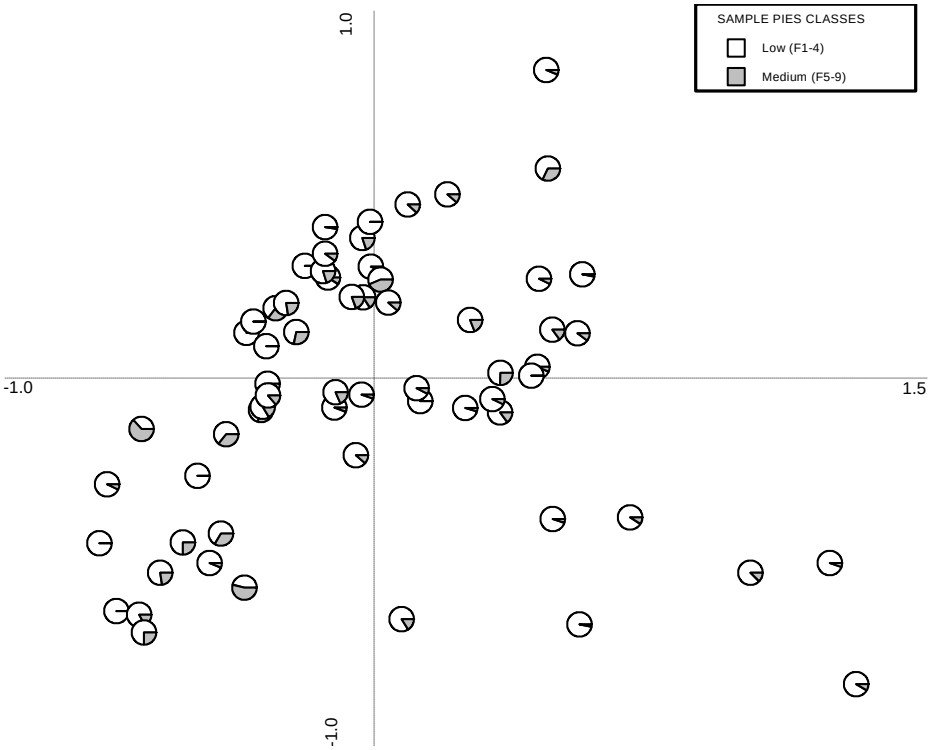


Fig 7.43. Correspondence analysis of the proportion of weed species according to their moisture indicator value for samples identified as unsieved fine sieving by-products (after Borhidi 1995): LBA Feudvar

Fig 7.44. Correspondence analysis of crops and weed species for samples identified as unsieved fine sieving by-products showing the ecological indicator values for reaction (after Borhidi 1995): LBA Feudvar

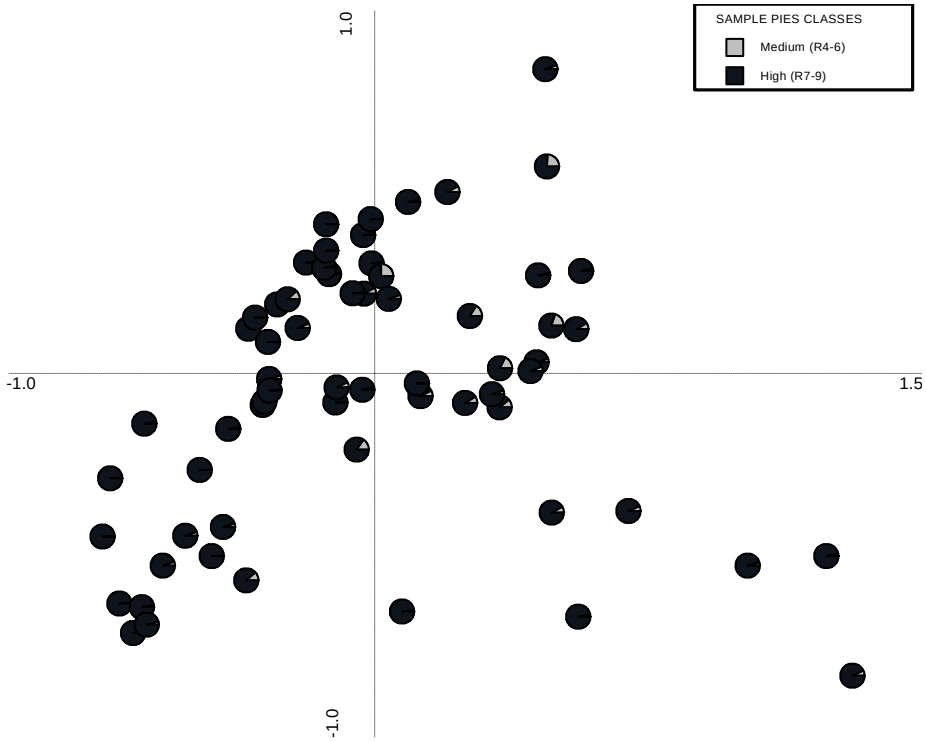


Fig 7.45. Correspondence analysis of the proportion of weed species according to their reaction indicator value for samples identified as unsieved fine sieving by-products (after Borhidi 1995): LBA Feudvar

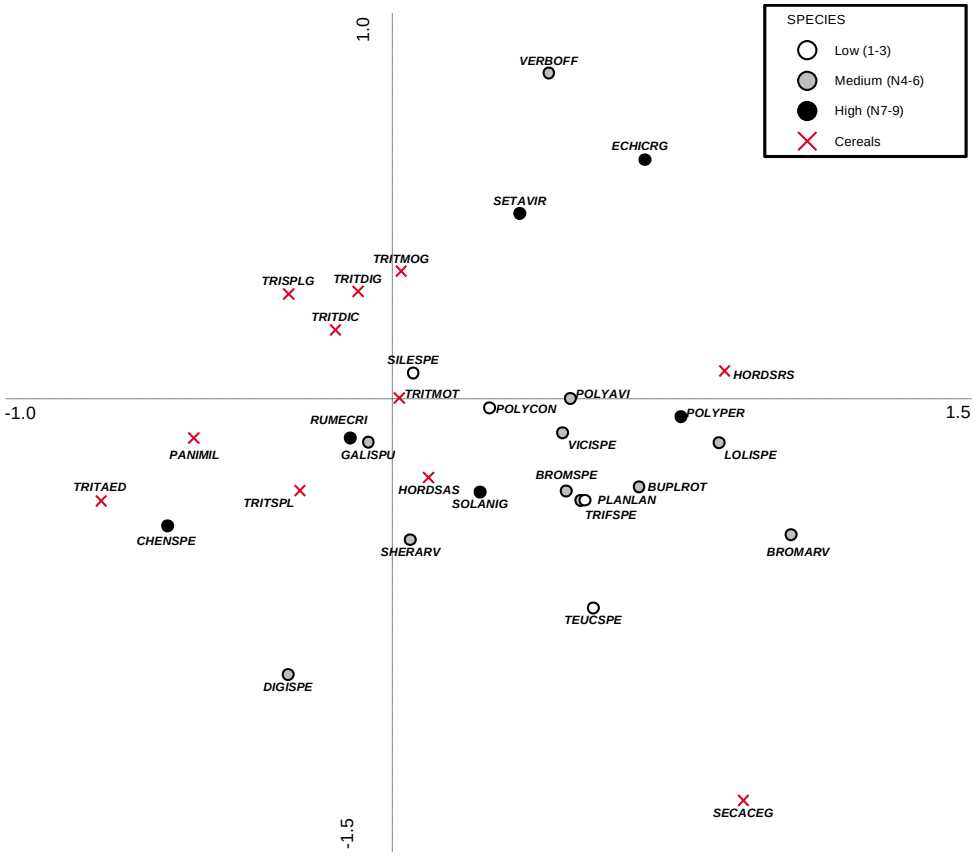


Fig 7.46. Correspondence analysis of crops and weed species for samples identified as unsieved fine sieving by-products showing the ecological indicator values for nitrogen (after Borhidi 1995): LBA Feudvar

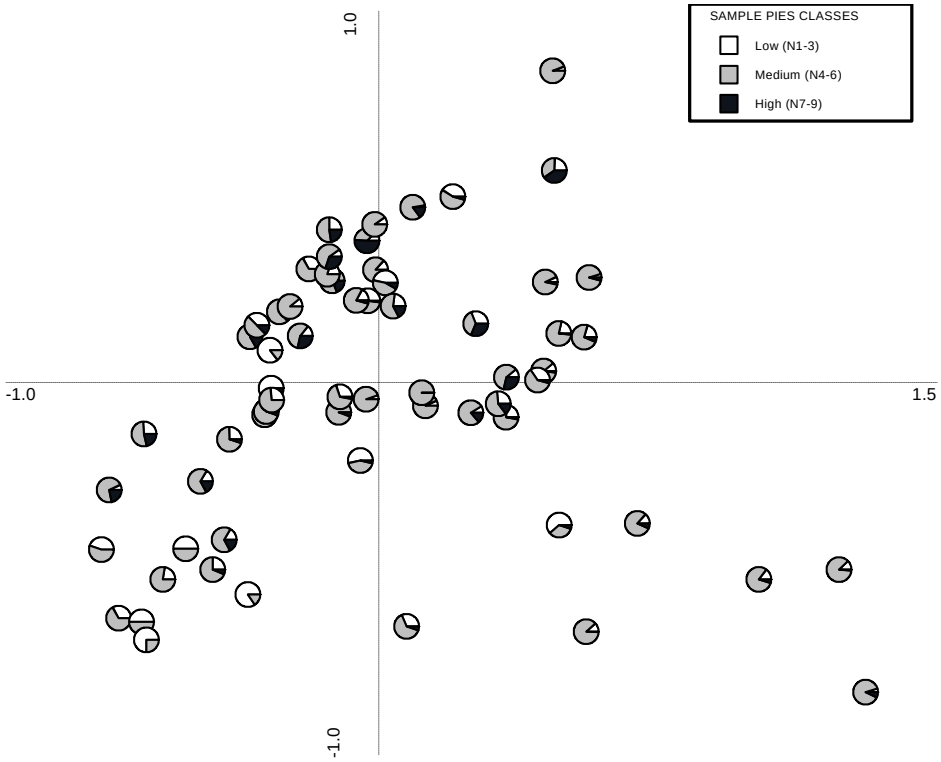


Fig 7.47. Correspondence analysis of the proportion of weed species, without CHENSPE, according to their nitrogen indicator value for samples identified as unsieved fine sieving by-products (after Borhidi 1995): LBA Feudvar

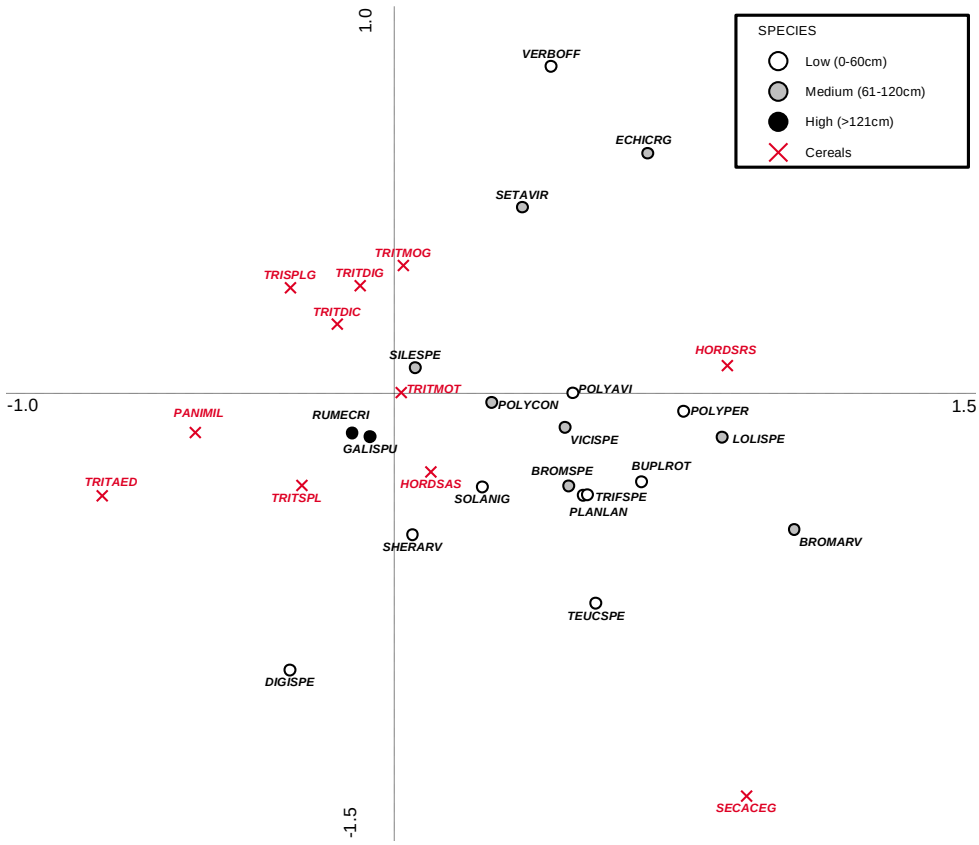


Fig 7.48. Correspondence analysis of crops and weed species for samples identified as unsieved fine sieving by-products, without CHENSPE, showing the maximum flowering height for each weed (after Bojňanský and Fargašová 2007): LBA Feudvar

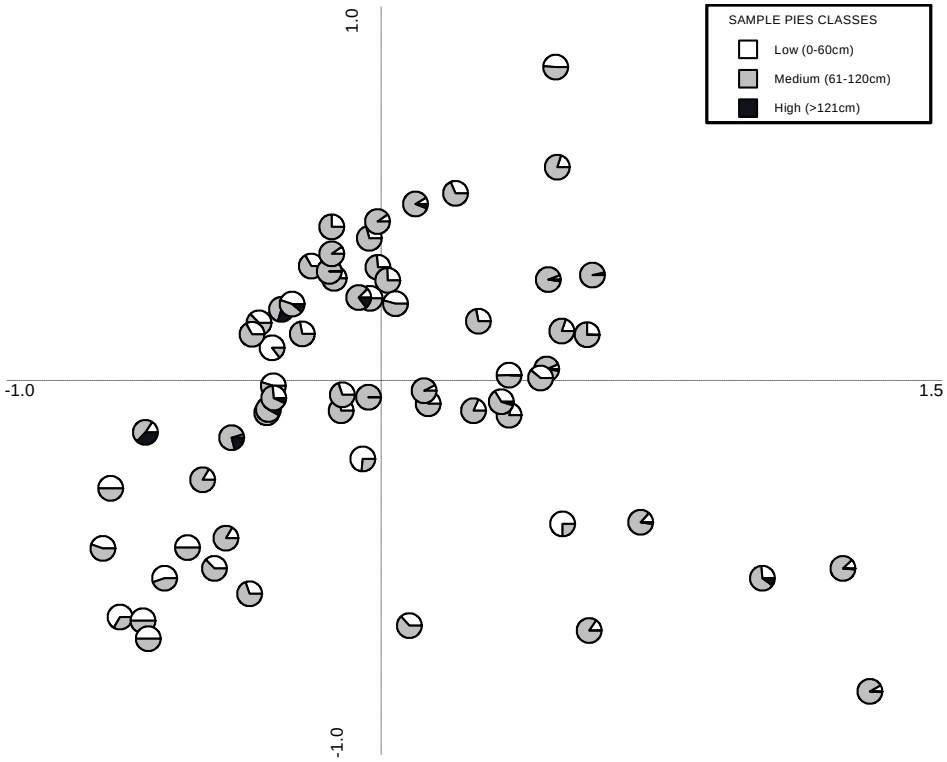


Fig 7.49. Correspondence analysis showing the proportions of weed species, without CHENSPE, according to their maximum flowering height for samples identified as unsieved fine sieving by-products spikelets (after Bojňanský and Fargašová 2007): LBA Feudvar

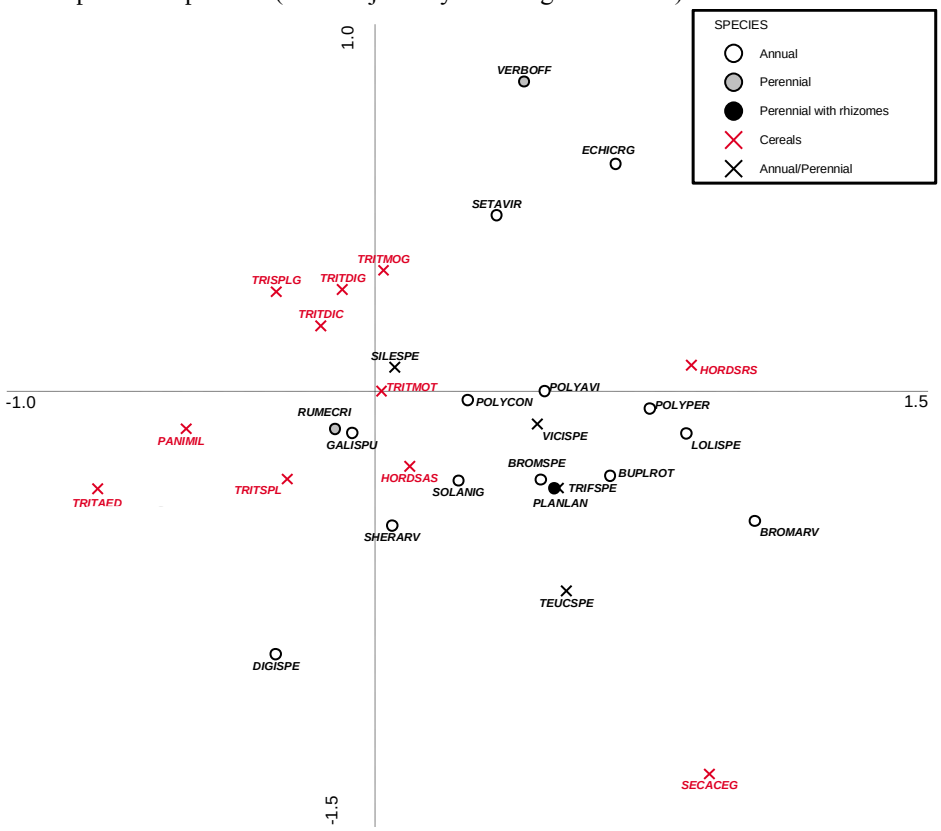


Fig 7.50. Correspondence analysis of crops and weed species for samples identified as unsieved fine sieving by-products, without CHENSPE, showing the life cycle of each weed i.e. whether they are an annual, perennial with or without rhizomes (after Bojňanský and Fargašová 2007): LBA Feudvar

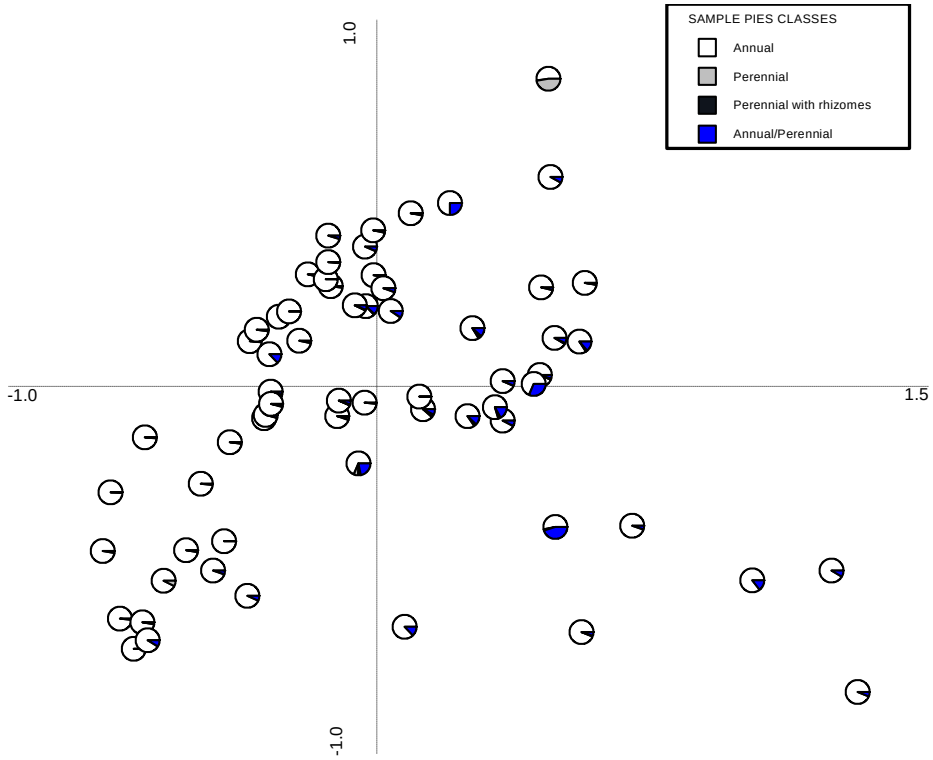


Fig 7.51. Correspondence analysis showing proportions of annuals and perennials for samples identified as unsieved fine sieving by-products, without CHENSPE (after Bojňanský and Fargašová 2007): LBA Feudvar

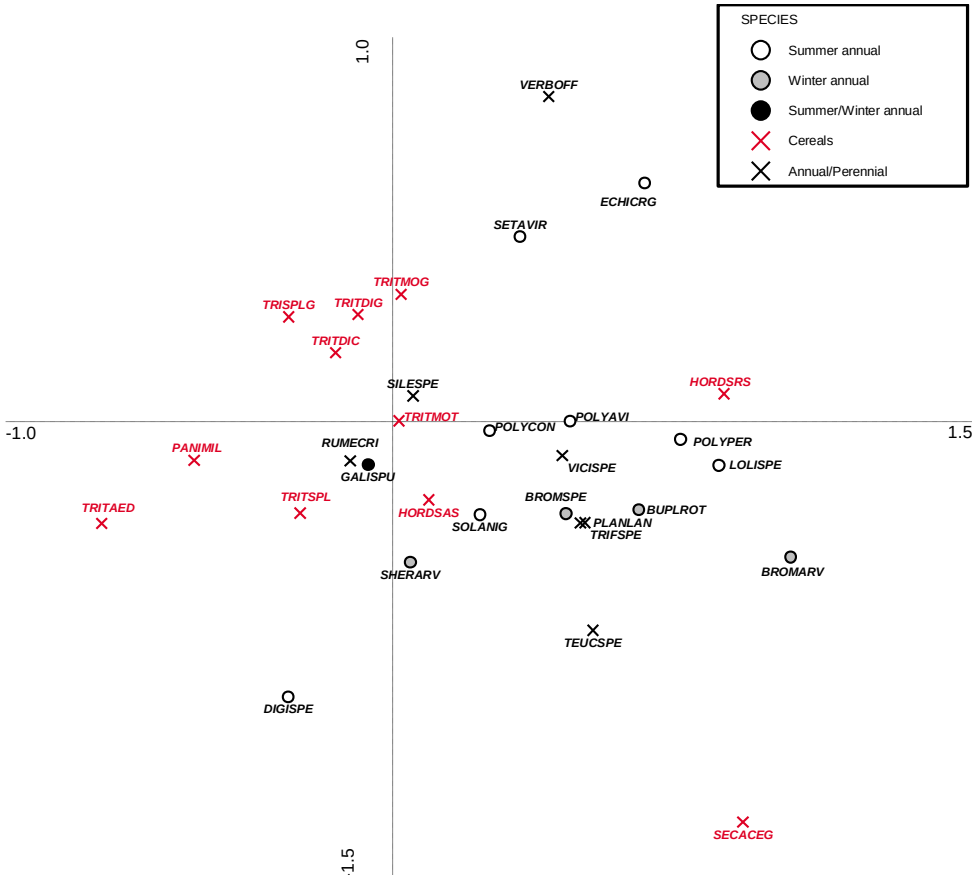


Fig 7.52. Correspondence analysis of crops and weed species for samples identified as unsieved fine sieving by-products, without CHENSPE, showing the germination time of each weed (after Bojňanský and Fargašová 2007): LBA Feudvar

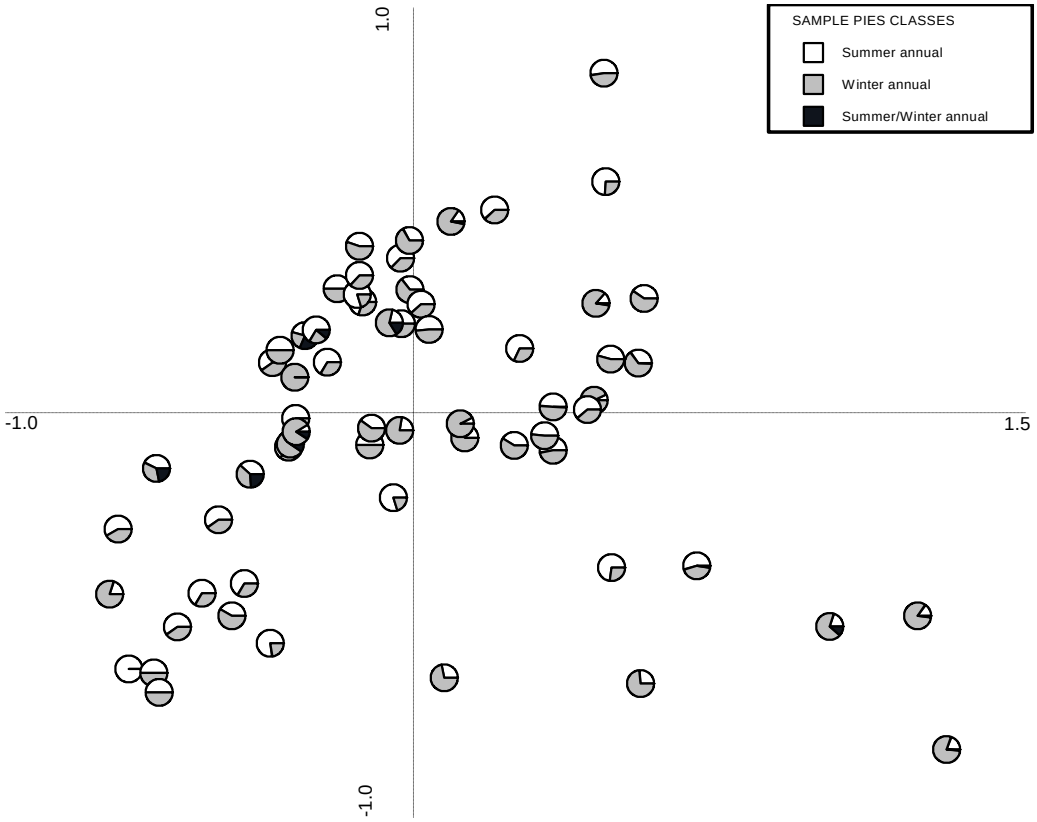


Fig 7.53. Correspondence analysis showing proportions of summer and winter annuals for samples, without CHENSPE, identified as unsieved fine sieving by-products (after Bojňanský and Fargašová 2007): LBA

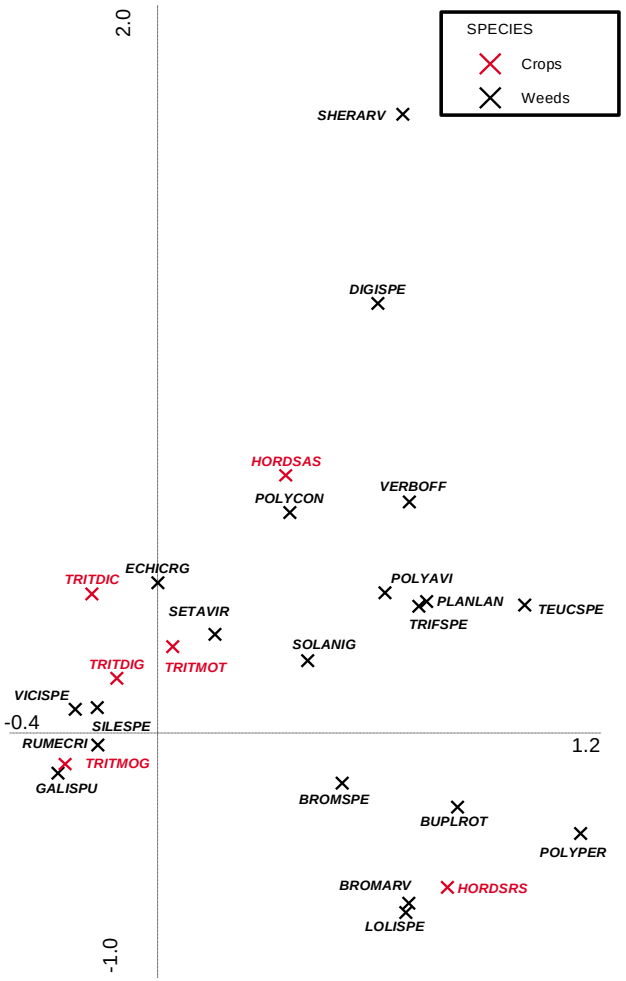


Fig 7.54. Correspondence analysis of crops, possible crops and weed species, without TRITSPL, TRITAED, CHENSPE, SECACEG AND PANMIL, for samples identified as unsieved fine sieving by-products: LBA Feudvar

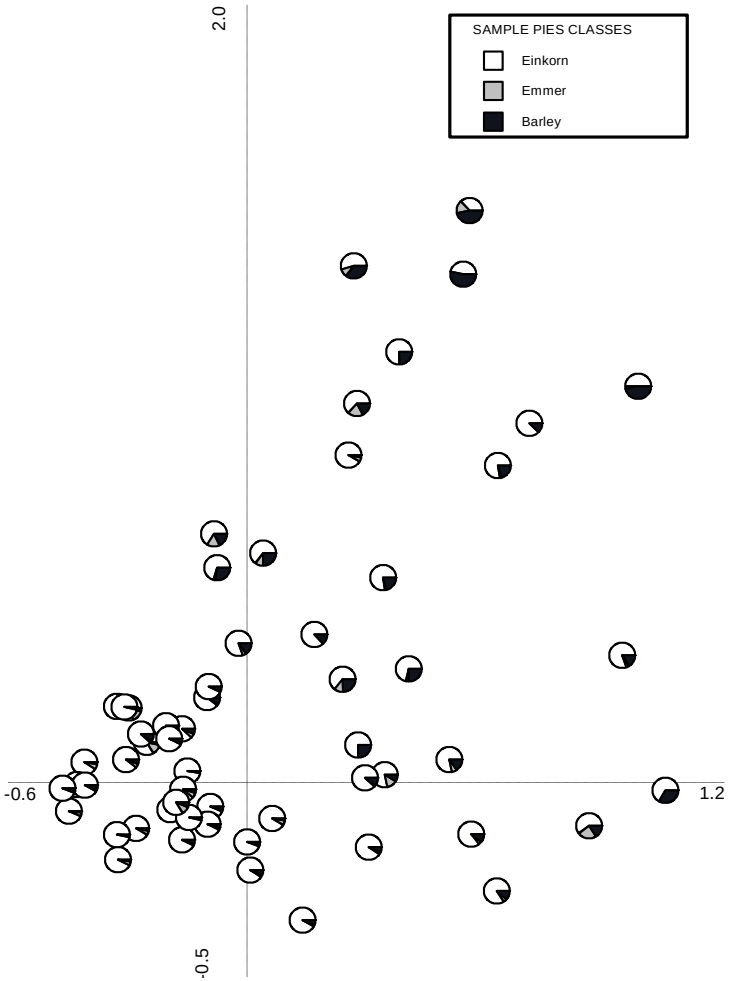


Fig 7.55. Correspondence analysis of the proportion of cereals per sample, without TRITSPL, TRITAED, CHENSPE, SECACEG AND PANMIL, identified as unsieved fine sieving by-products: LBA Feudvar

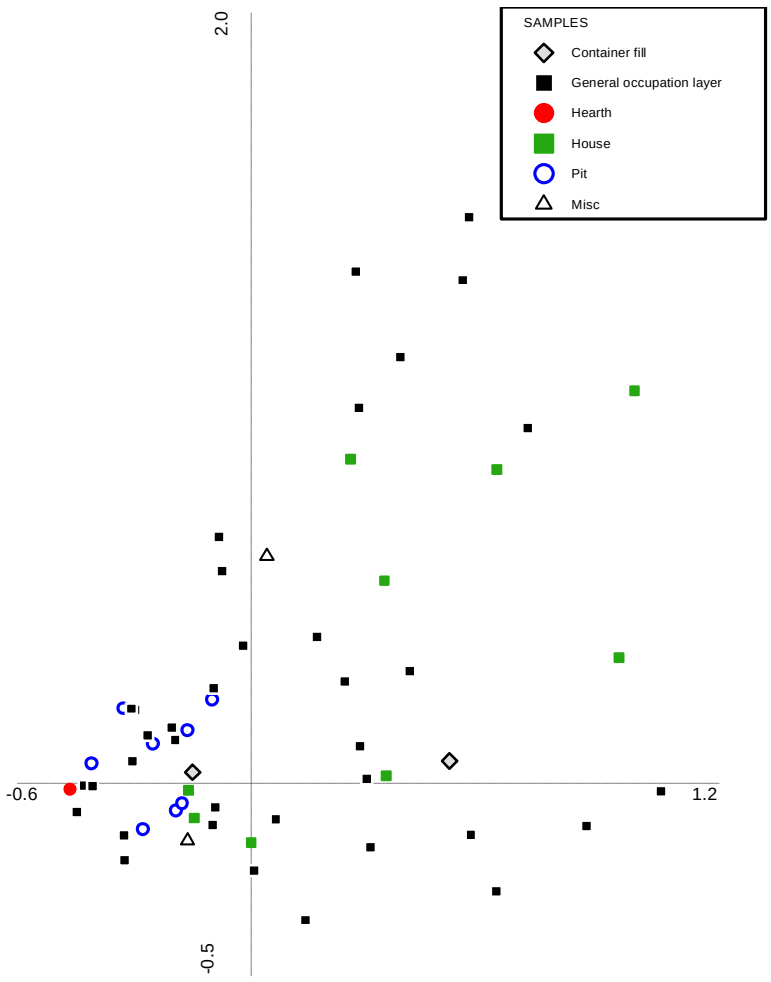


Fig 7.56. Correspondence analysis of samples, without TRITSPL, TRITAED, CHENSPE, SECACEG AND PANMIL, identified as unsieved fine sieving by-products per feature type: LBA Feudvar

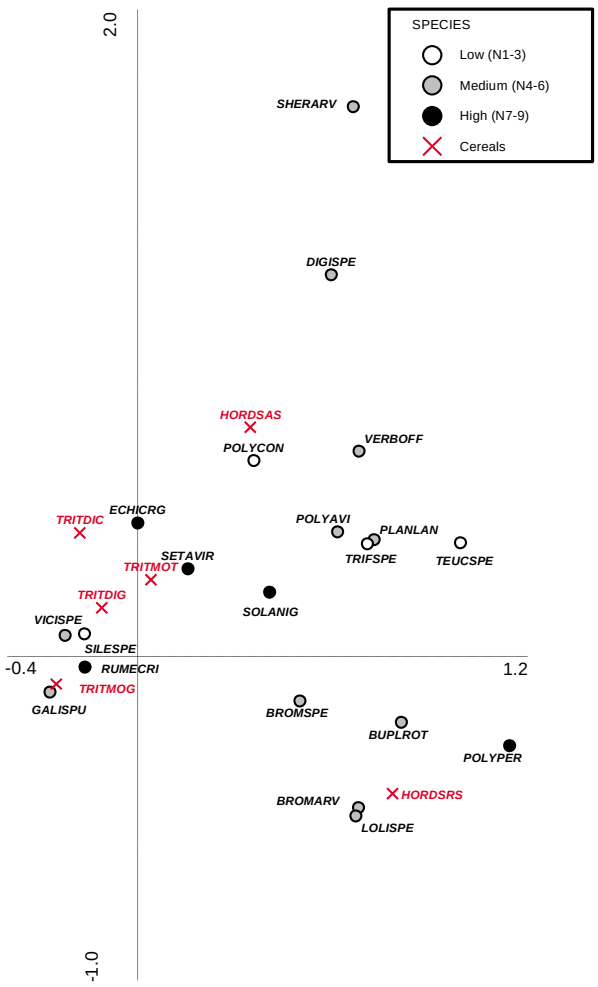


Fig 7.57. Correspondence analysis of crops and weed species, without TRITSPL, TRITAED, CHENSPE, SECACEG AND PANMIL, for samples identified as unsieved fine sieving by-products showing the ecological indicator values for nitrogen (after Borhidi 1995): LBA Feudvar

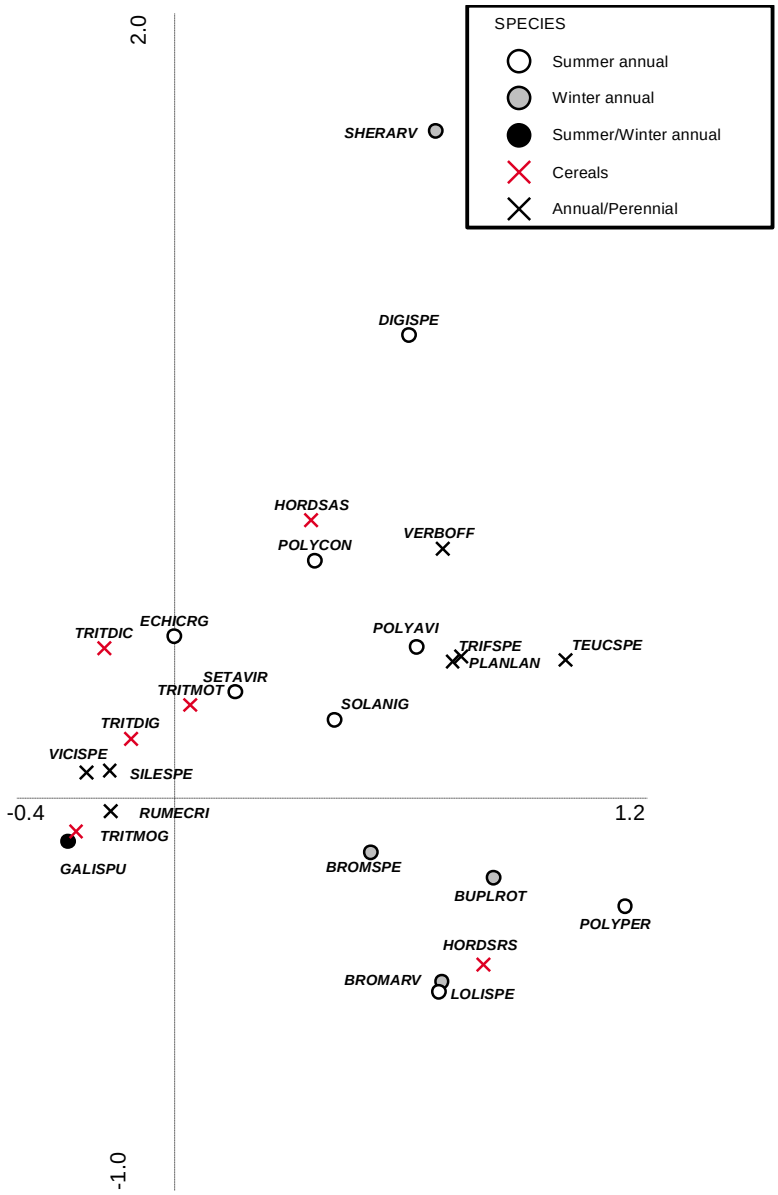


Fig 7.58. Correspondence analysis of crops and weed species , without TRITSPL, TRITAED, CHENSPE, SECACEG AND PANMIL, for samples identified as unsieved fine sieving by-products showing the germination time of each weed (after Bojňanský and Fargašová 2007): LBA Feudvar

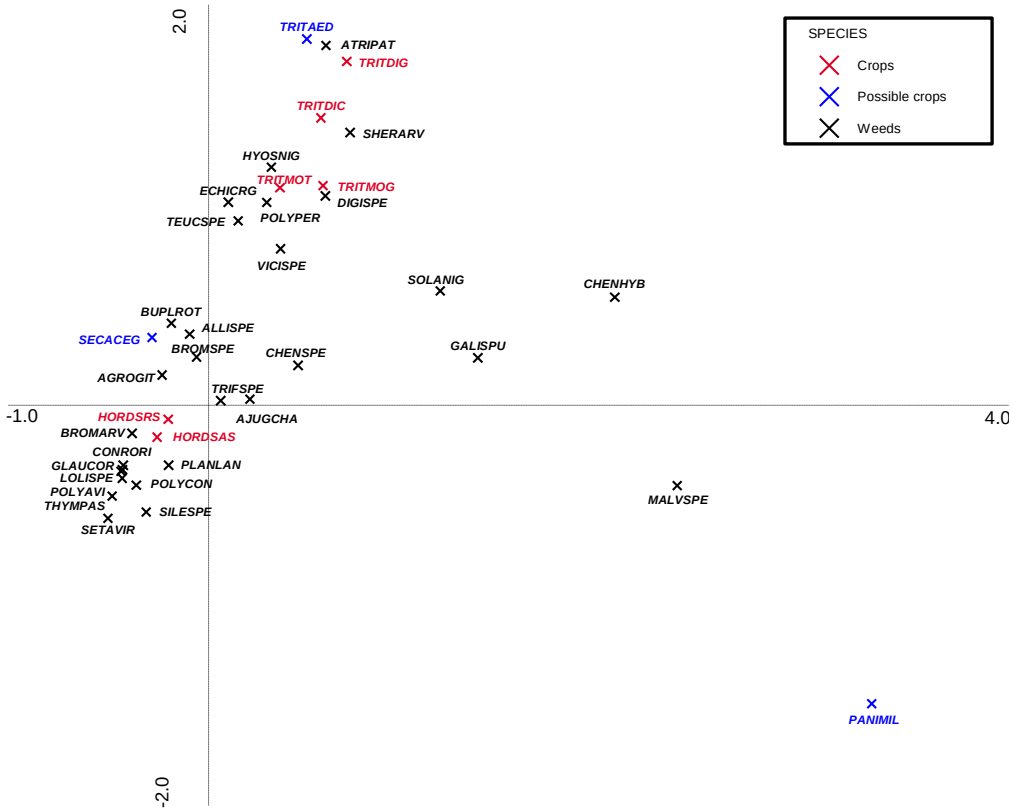


Fig 7.59. Correspondence analysis of crops, possible crops and weed species for samples identified as unsieved products on the first two principal axes (axis 1 horizontal, axis 2 vertical): LBA Feudvar

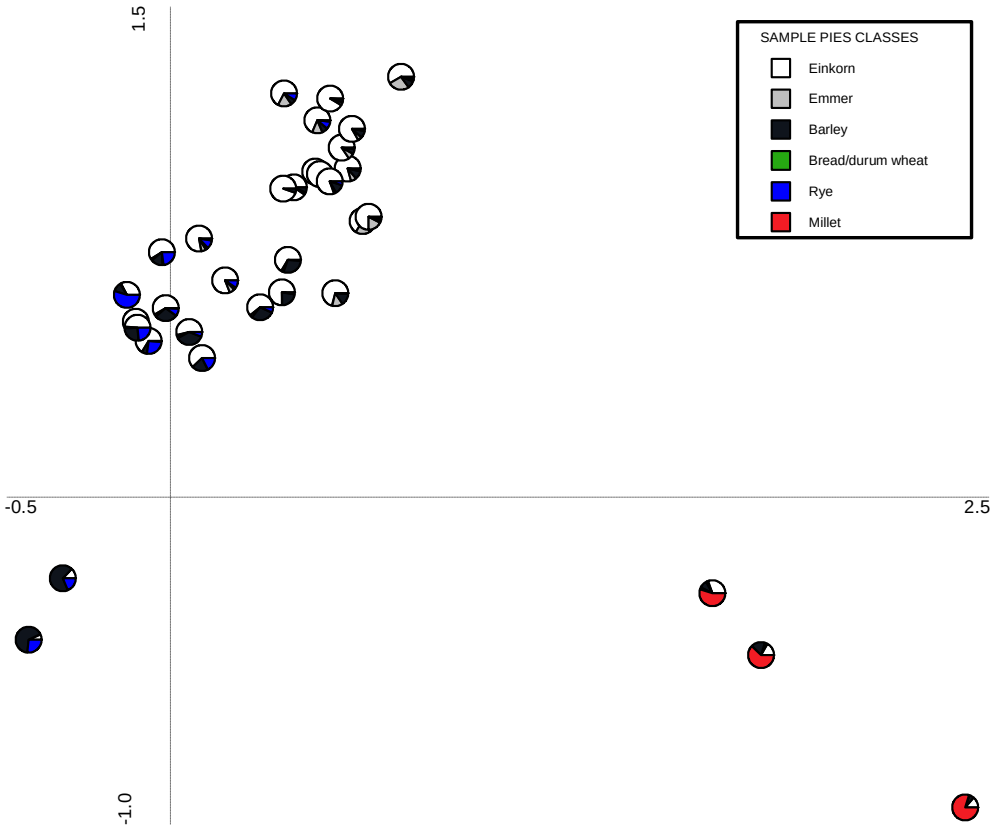


Fig 7.60. Correspondence analysis of the proportion of cereals per sample identified as unsieved products: LBA Feudvar

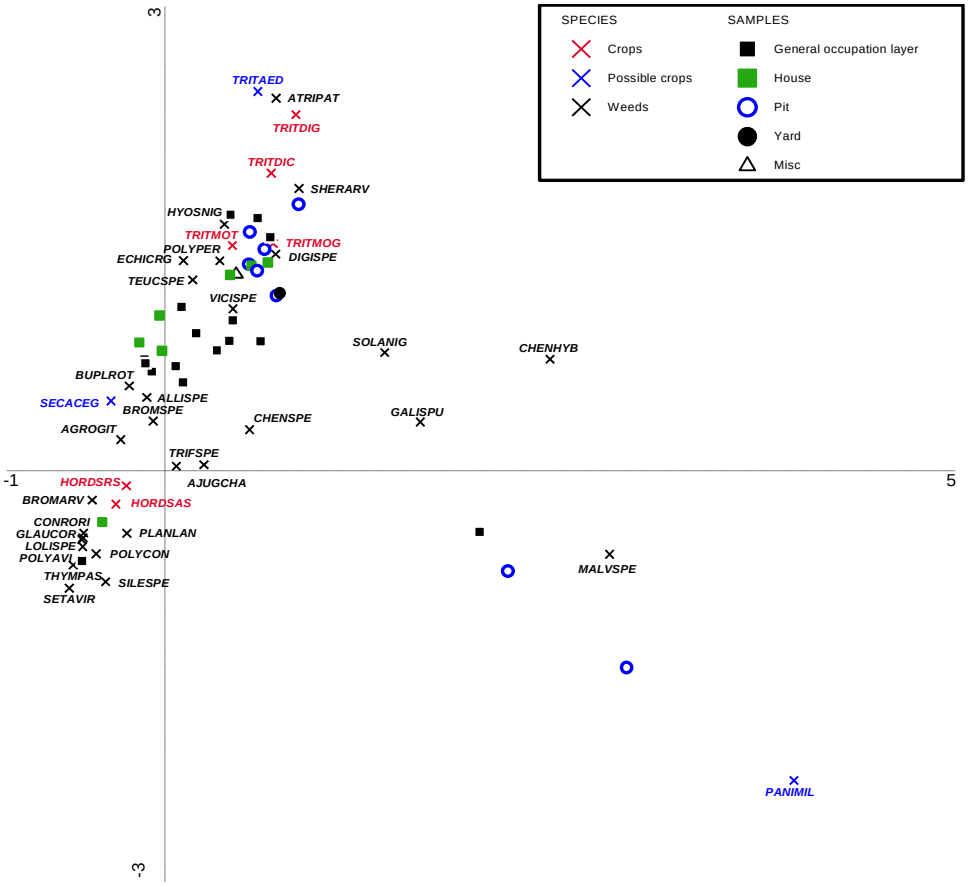


Fig 7.61. Correspondence analysis of crops, possible crops and weed species for samples identified as unsieved products per feature type: LBA Feudvar

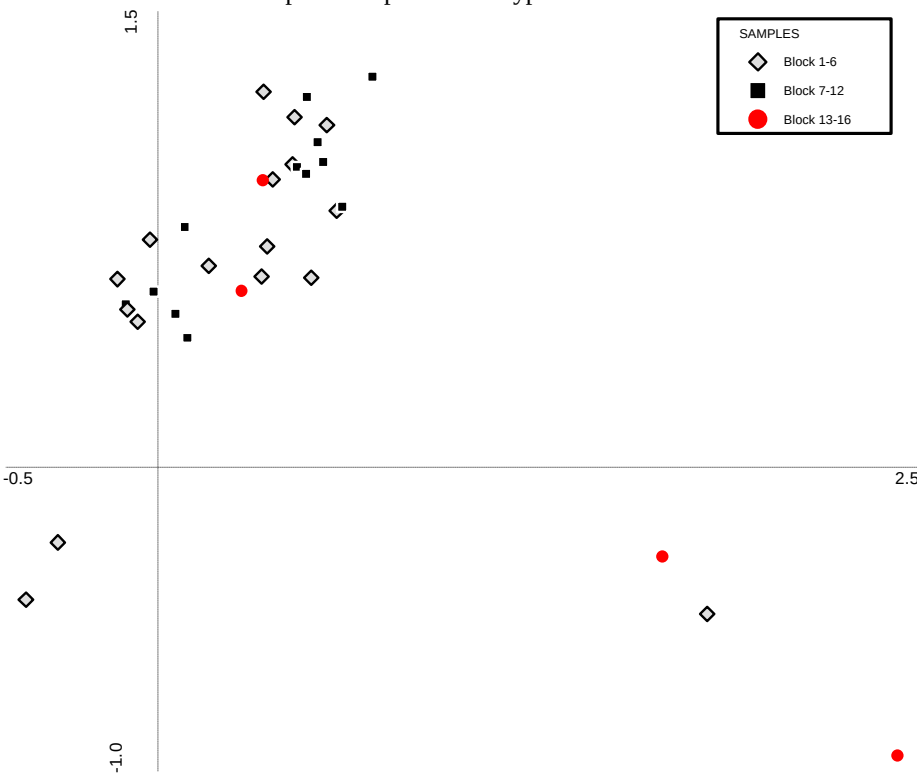


Fig 7.62. Correspondence analysis of each sample identified as unsieved products per block group: LBA Feudvar

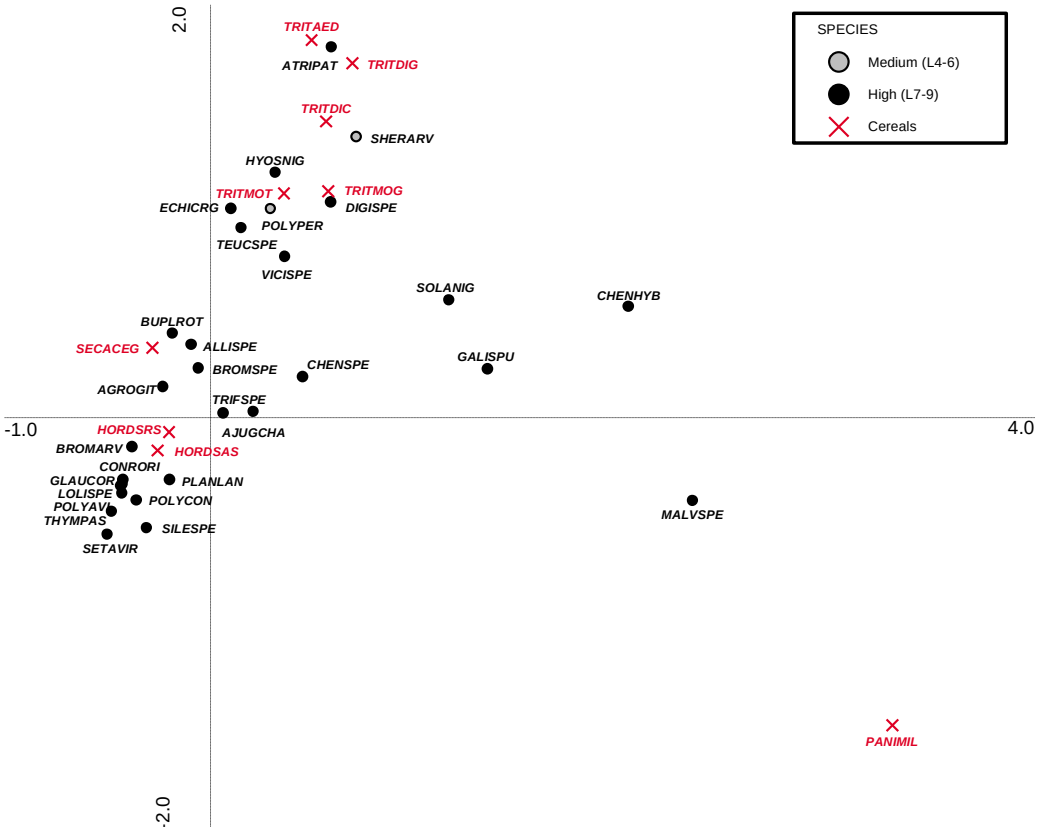


Fig 7.63. Correspondence analysis of crops and weed species for samples identified as unsieved products showing the ecological indicator values for light (after Borhidi 1995): LBA Feudvar

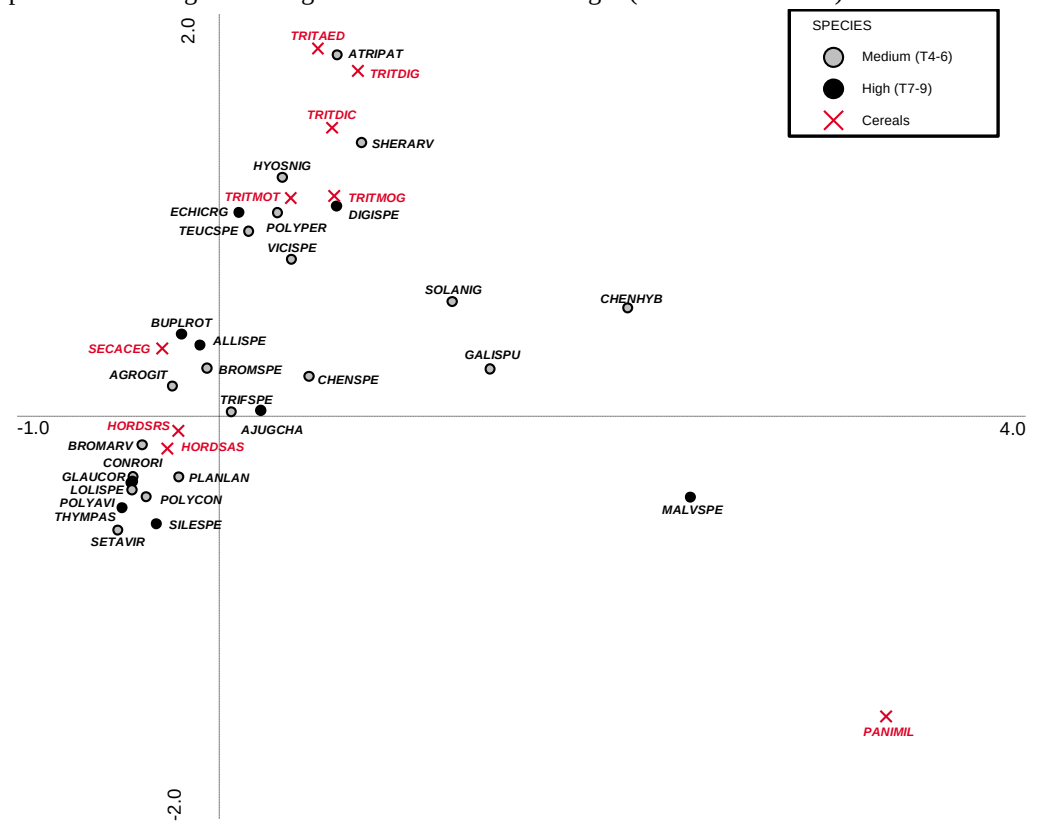


Fig 7.64. Correspondence analysis of crops and weed species for samples identified as unsieved products showing the ecological indicator values for temperature (after Borhidi 1995): LBA Feudvar

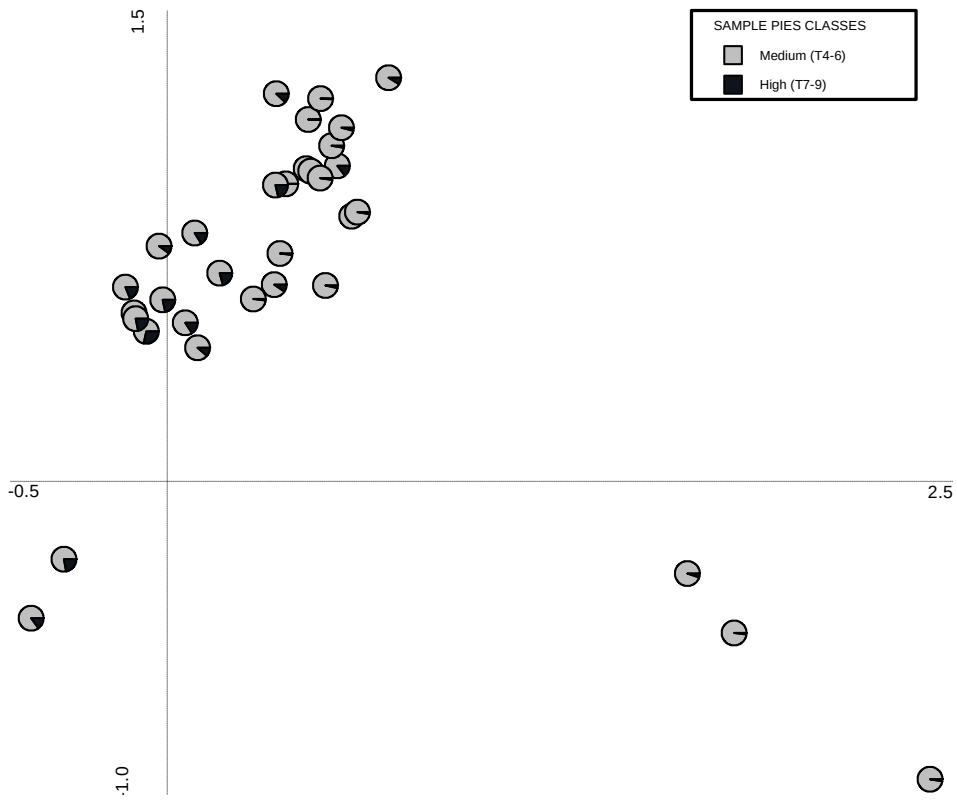


Fig 7.65. Correspondence analysis of the proportion of weed species according to their temperature indicator value for samples identified as unsieved products (after Borhidi 1995): LBA Feudvar

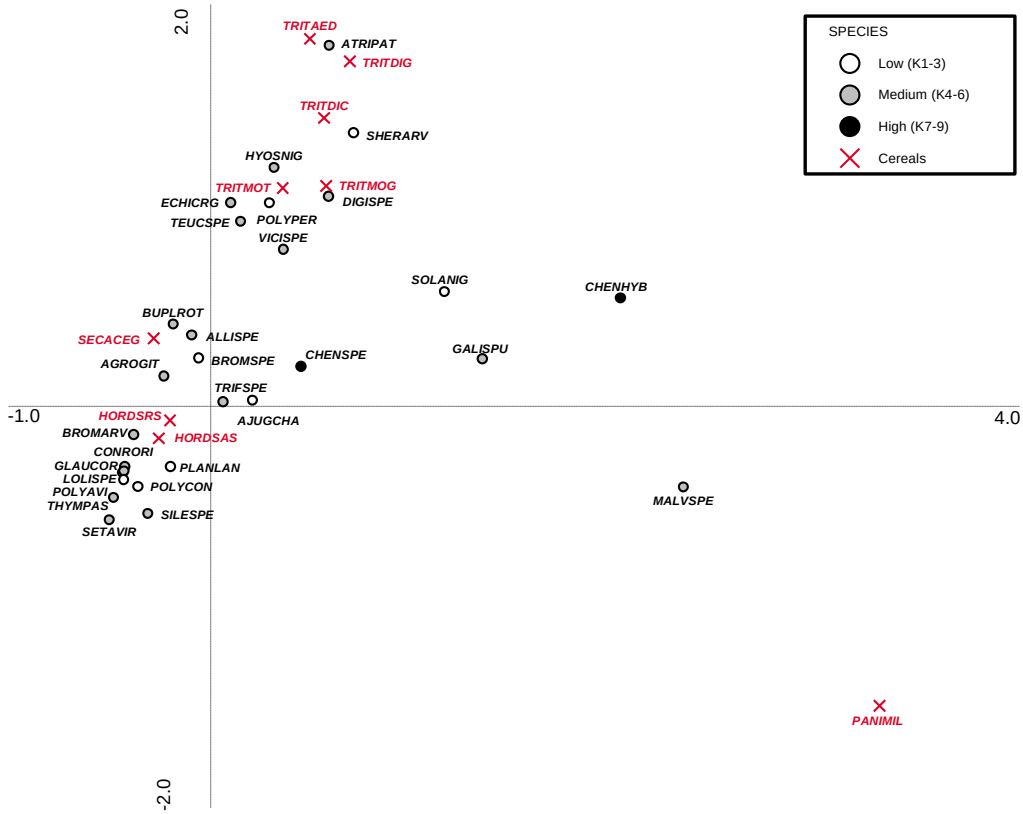


Fig 7.66. Correspondence analysis of crops and weed species for samples identified as unsieved products showing the ecological indicator values for continentality (after Borhidi 1995): LBA Feudvar

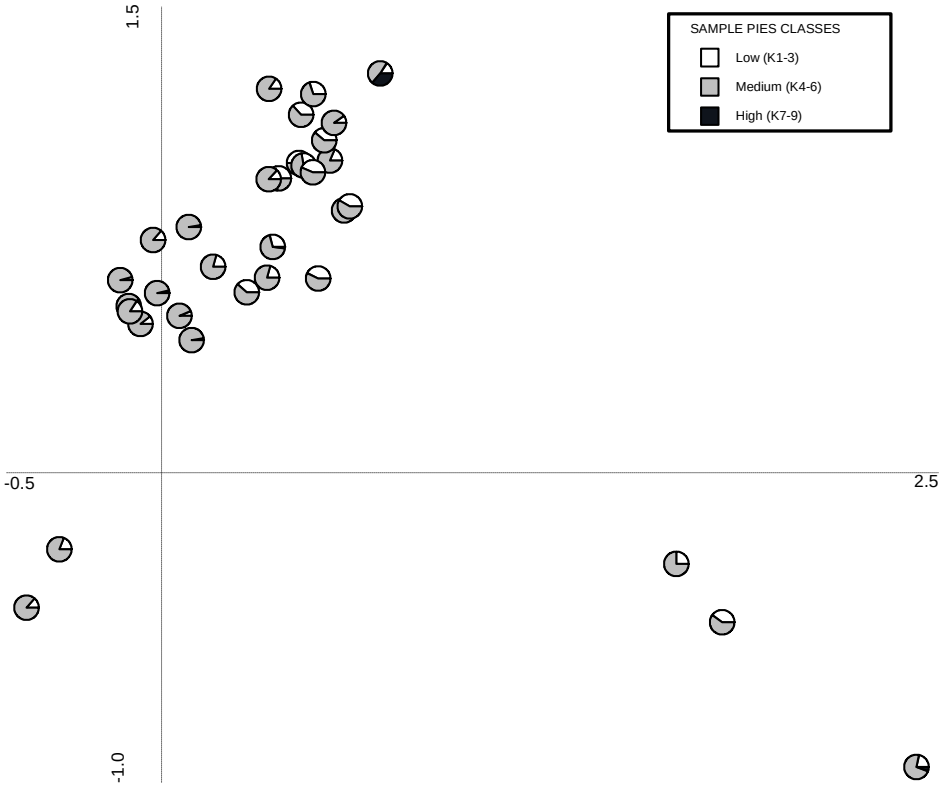


Fig 7.67. Correspondence analysis of the proportion of weed species, without CHENSPE, according to their continentality indicator value for samples identified as unsieved products (after Borhidi 1995): LBA Feudvar

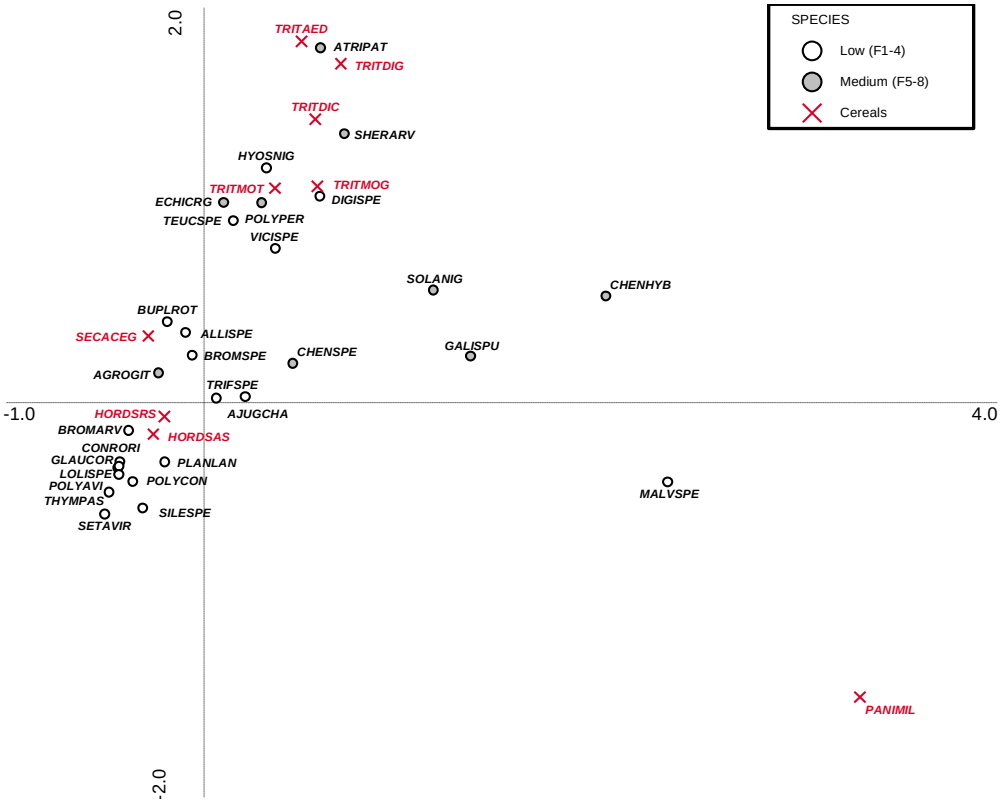


Fig 7.68. Correspondence analysis of crops and weed species for samples identified as unsieved products showing the ecological indicator values for moisture (after Borhidi 1995): LBA Feudvar

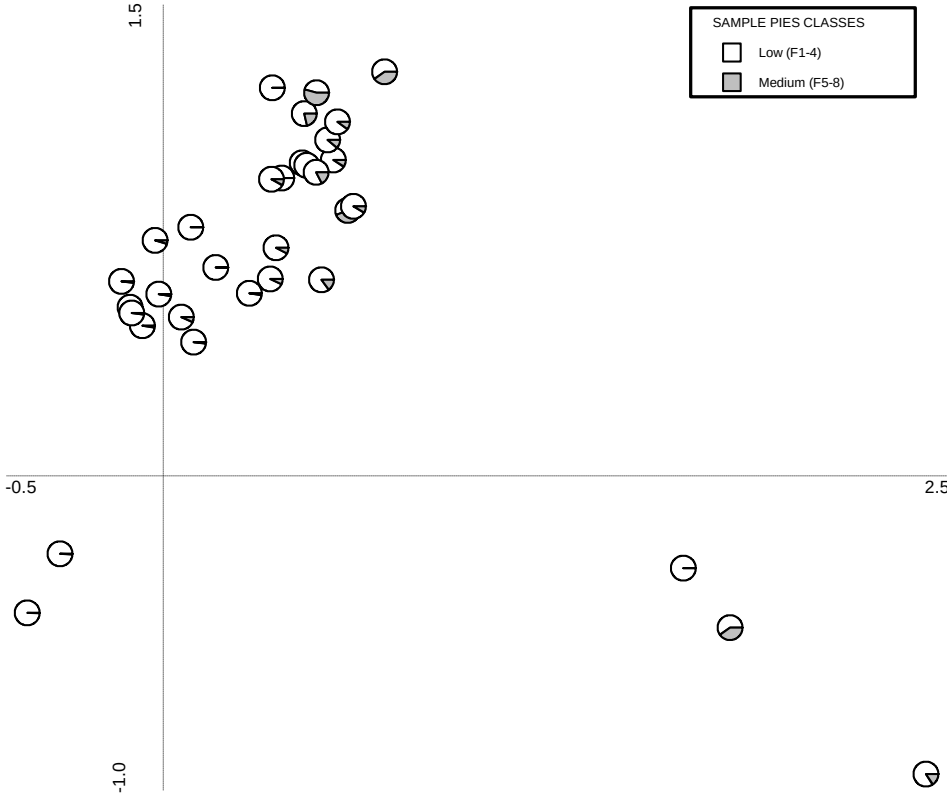


Fig 7.69. Correspondence analysis of the proportion of weed species, without CHENSPE, according to their moisture indicator value for samples identified as unsieved products (after Borhidi 1995): LBA Feudvar

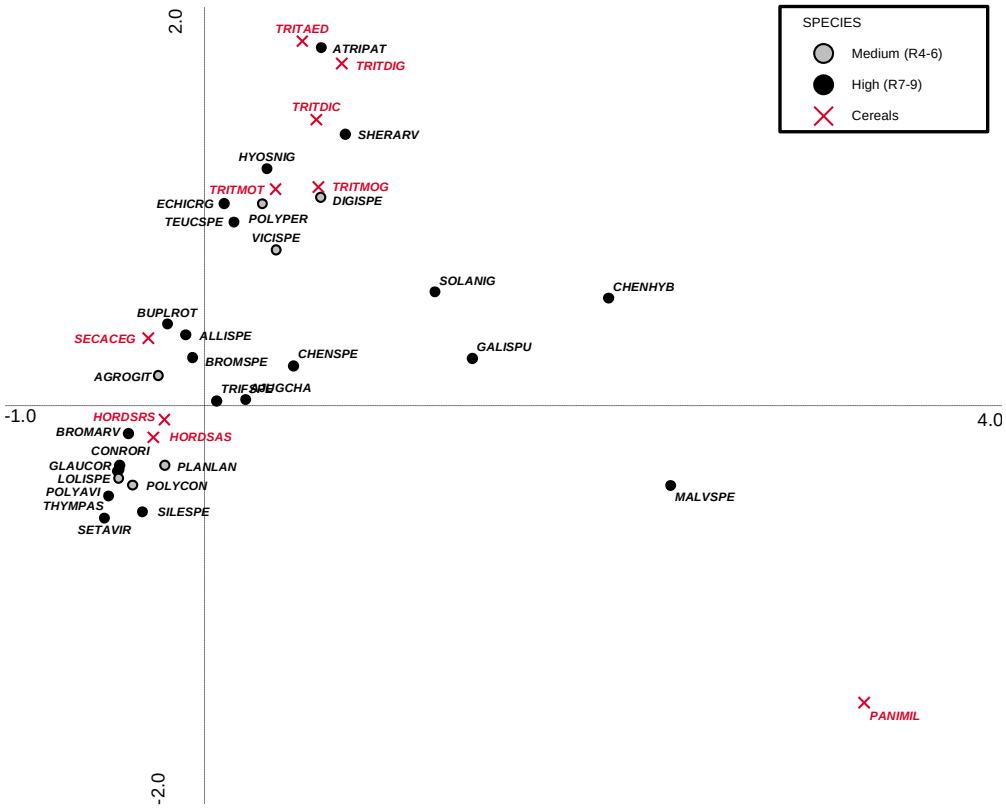


Fig 7.70. Correspondence analysis of crops and weed species for samples identified as unsieved products showing the ecological indicator values for reaction (after Borhidi 1995): LBA Feudvar

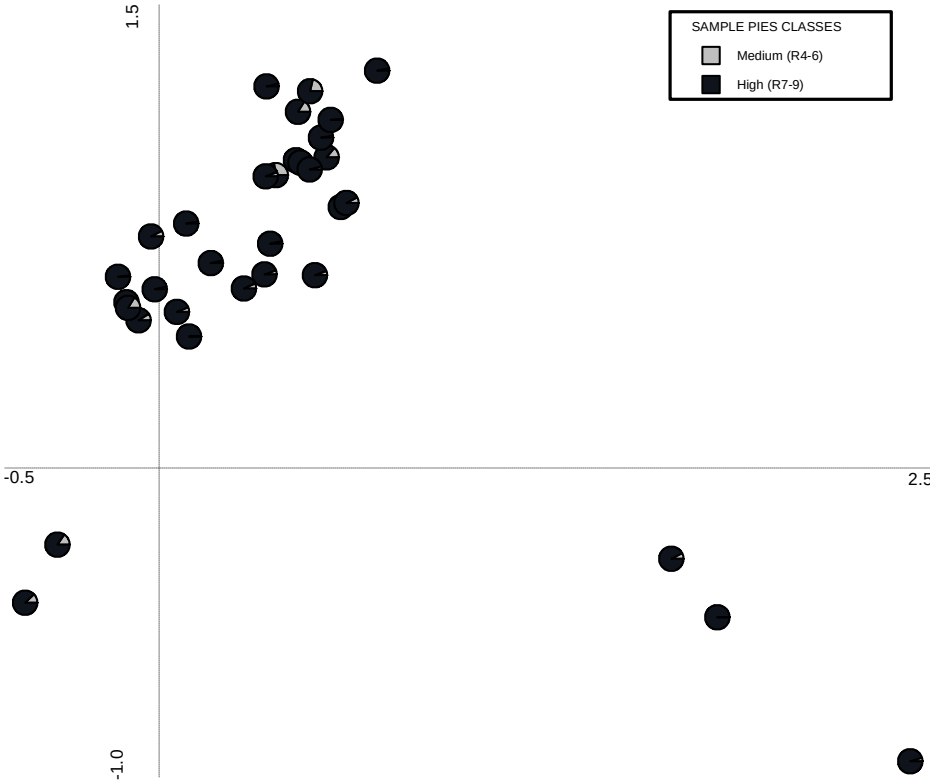


Fig 7.71. Correspondence analysis of the proportion of weed species according to their reaction indicator value for samples identified as unsieved products (after Borhidi 1995): LBA Feudvar

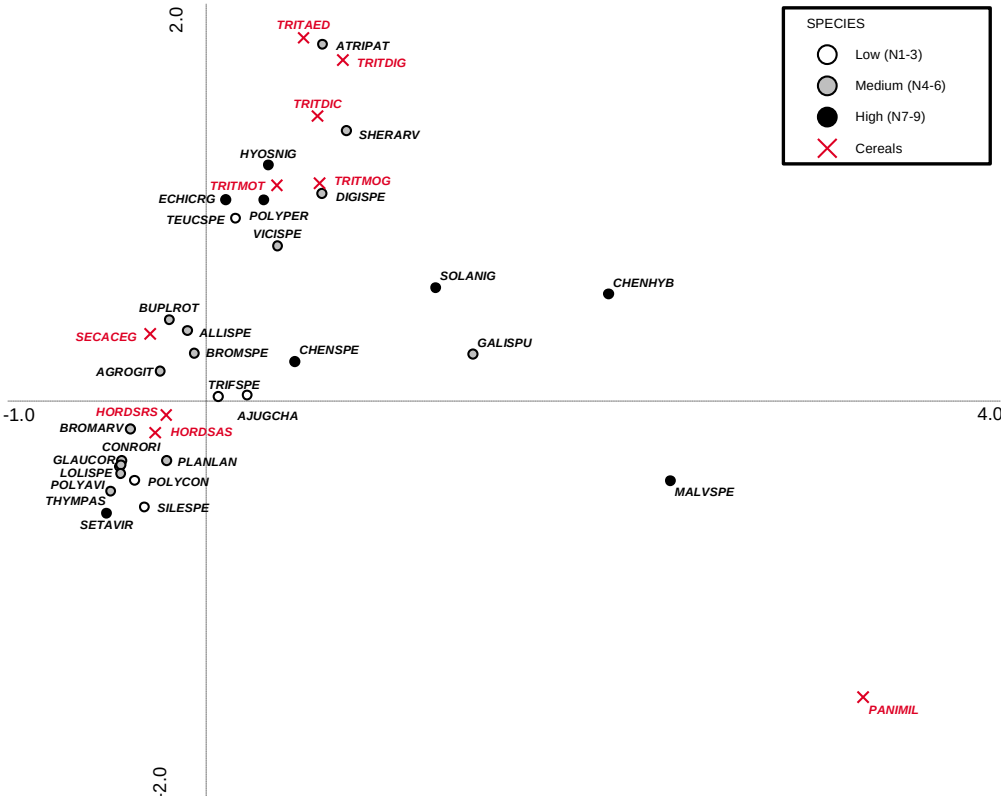


Fig 7.72. Correspondence analysis of crops and weed species for samples identified as unsieved products showing the ecological indicator values for nitrogen (after Borhidi 1995): LBA Feudvar

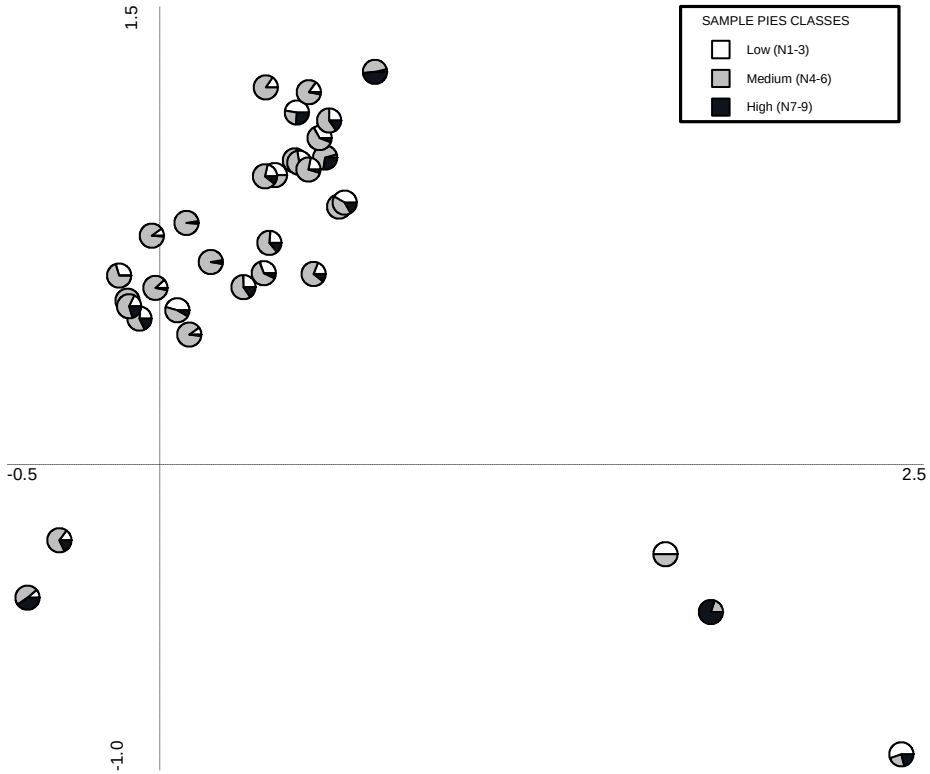


Fig 7.73. Correspondence analysis of the proportion of weed species, without CHENSPE, according to their nitrogen indicator value for samples identified as unsieved products (after Borhidi 1995): LBA Feudvar

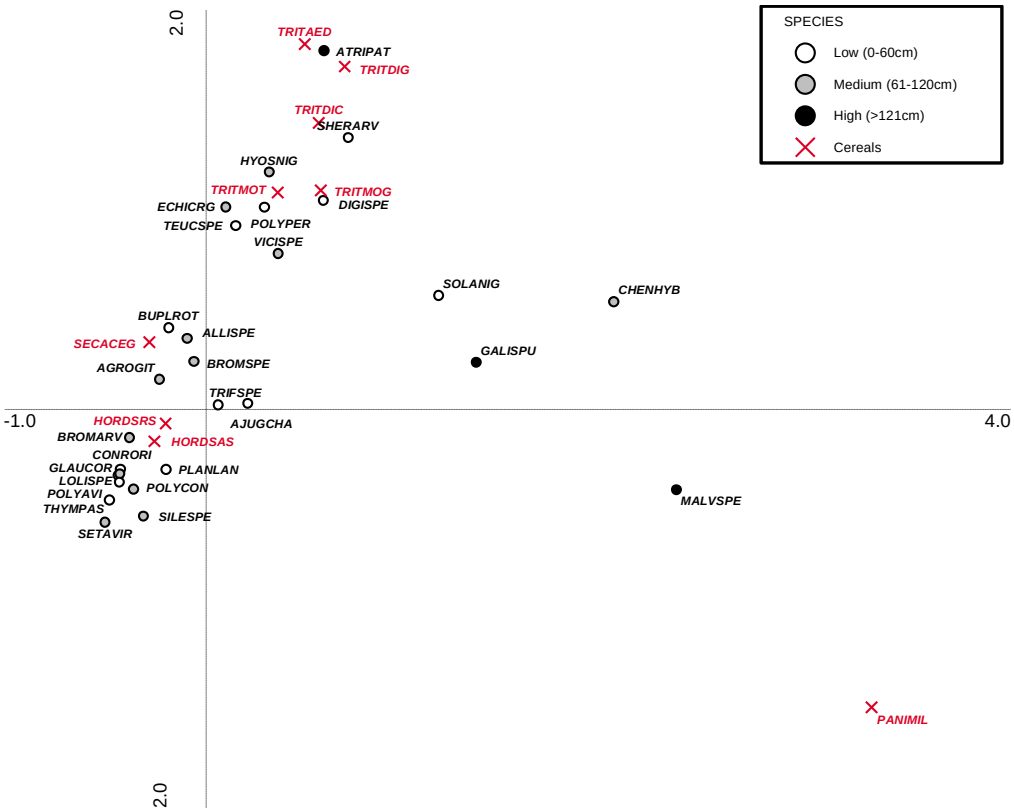


Fig 7.74. Correspondence analysis of crops and weed species for samples identified as unsieved products, without CHENSPE, showing the maximum flowering height for each weed (after Bojňanský and Fargašová 2007): LBA Feudvar

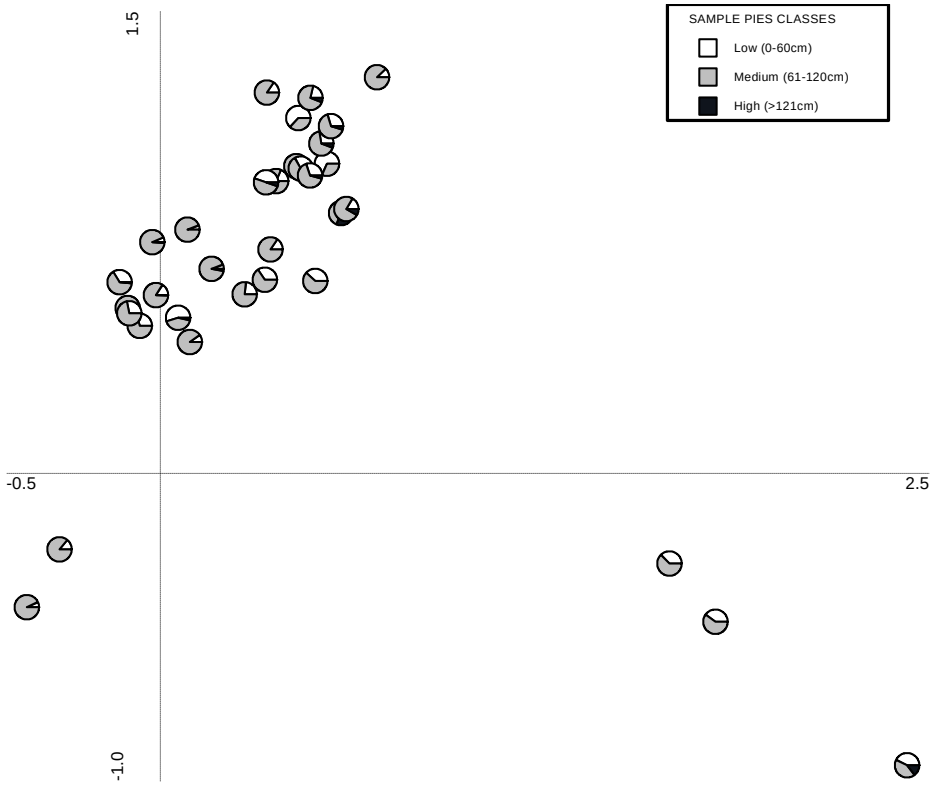


Fig 7.75. Correspondence analysis showing the proportions of weed species, without CHENSPE, according to their maximum flowering height for samples identified as unsieved products (after Bojňanský and Fargašová 2007): LBA Feudvar

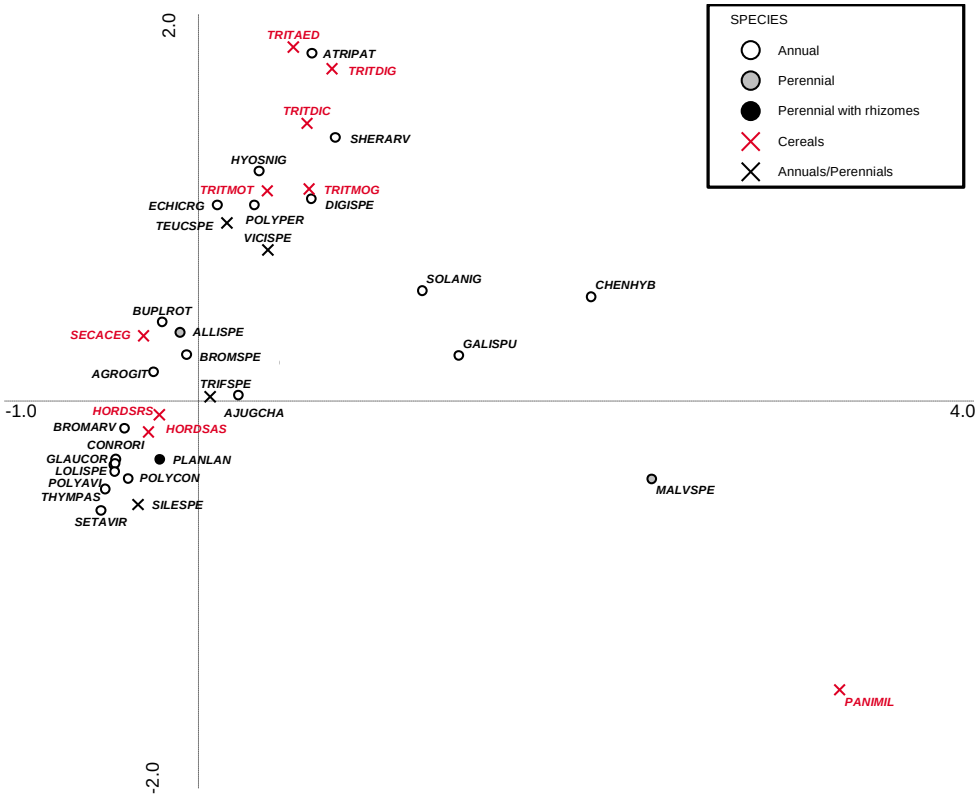


Fig 7.76. Correspondence analysis of crops and weed species for samples identified as unsieved products, without CHENSPE, showing the life cycle of each weed i.e. whether they are an annual, perennial with or without rhizomes (after Bojňanský and Fargašová 2007): LBA Feudvar

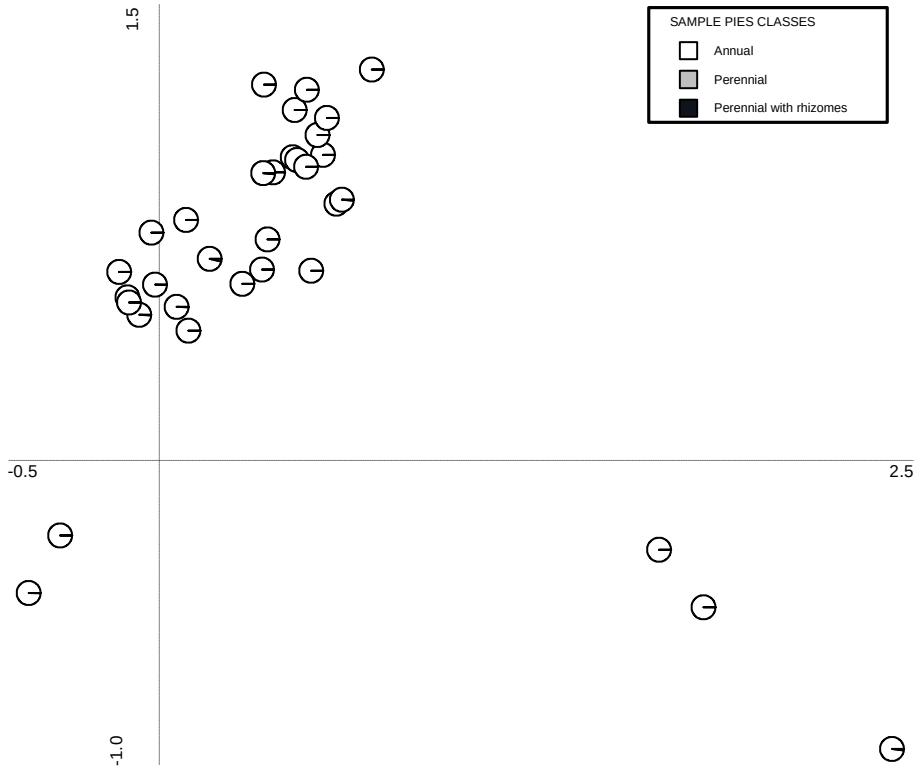


Fig 7.77. Correspondence analysis showing proportions of annuals and perennials for samples identified as unsieved products, without CHENSPE (after Bojňanský and Fargašová 2007): LBA Feudvar

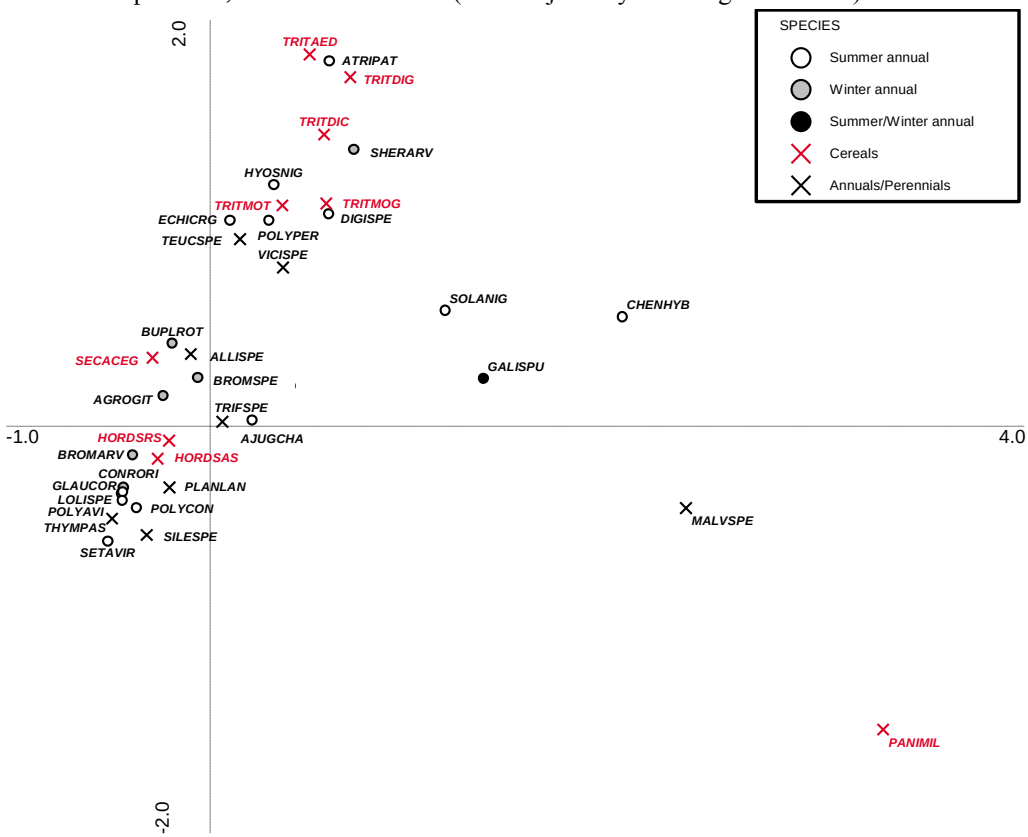


Fig 7.78 . Correspondence analysis of crops and weed species for samples identified as unsieved products, without CHENSPE, showing the germination time of each weed (after Bojňanský and Fargašová 2007): LBA Feudvar

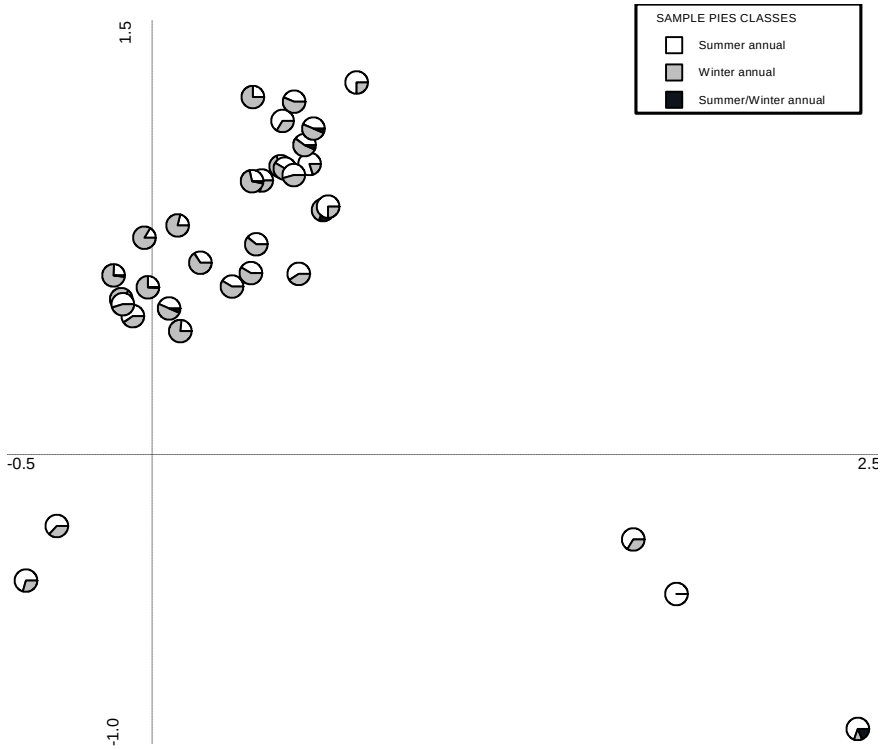


Fig 7.79. Correspondence analysis showing proportions of summer and winter annuals, without CHENSPE, for samples identified as unsieved products (after Bojňanský and Fargašová 2007): LBA Feudvar

Fig 7.80. Correspondence analysis of crops, possible crops and weed species, without TRITAED, CHENSPE, SECACEG AND PANMIL, for samples identified as unsieved products: LBA Feudvar

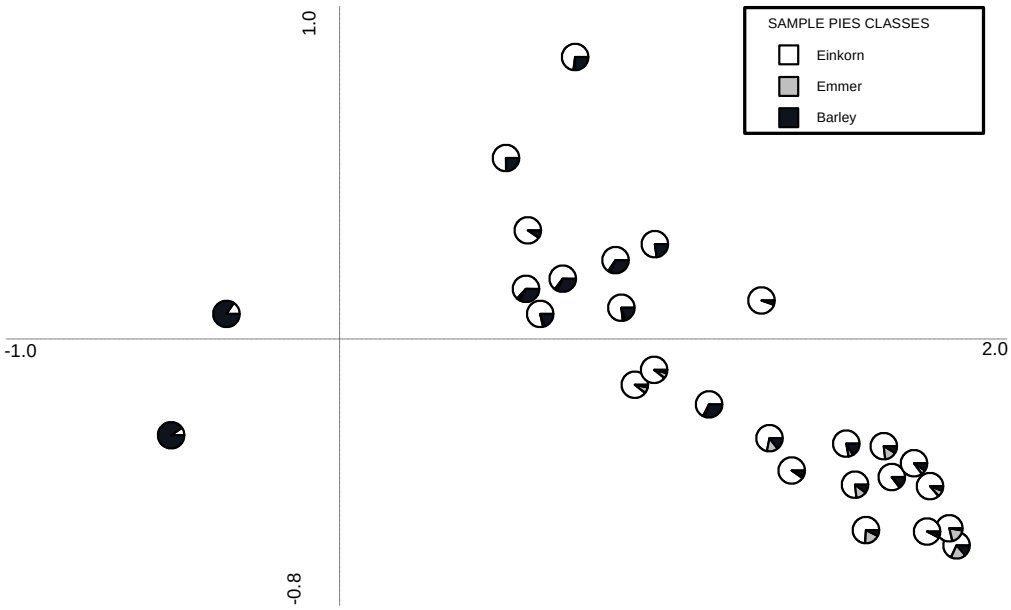


Fig 7.81. Correspondence analysis of the proportion of cereals per sample, without TRITAED, CHENSPE, SECACEG AND PANMIL, identified as unsieved fine products: LBA Feudvar

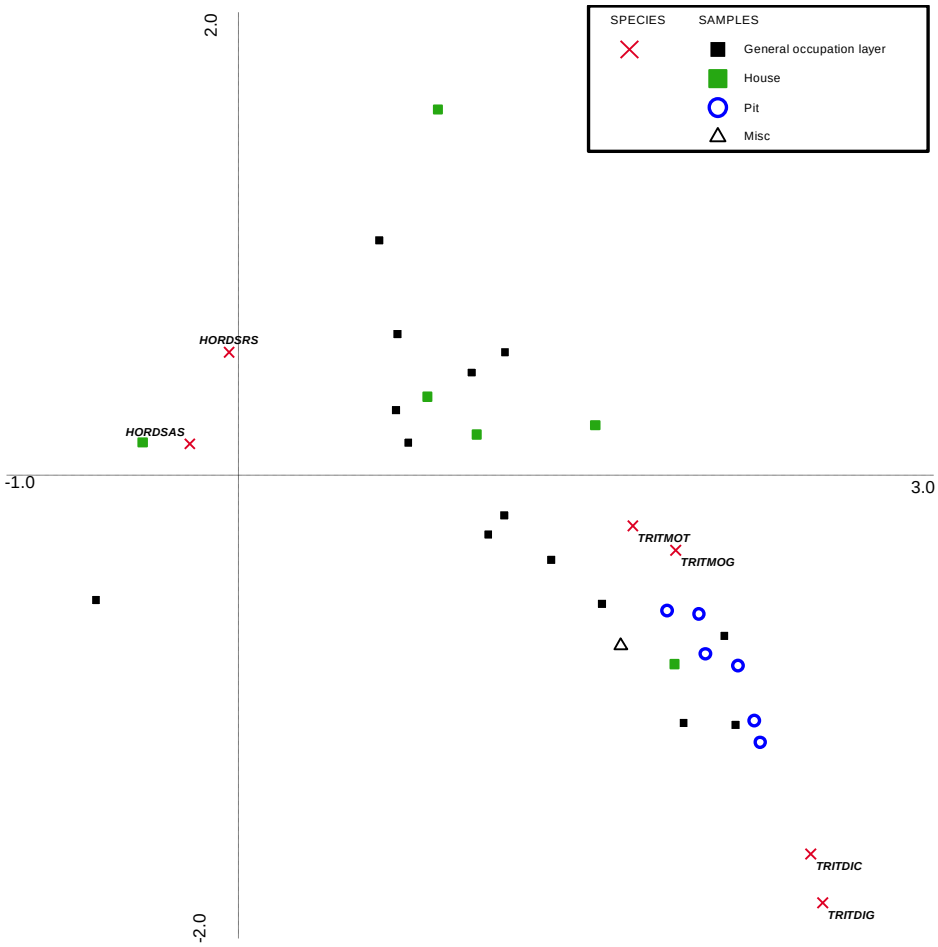


Fig 7.82. Correspondence analysis of samples, without TRITAED, CHENSPE, SECACEG AND PANMIL, identified as unsieved products per feature type: LBA Feudvar

Fig 7.83. Correspondence analysis of crops and weed species for samples, without TRITAED, CHENSPE, SECACEG AND PANMIL, identified as unsieved products showing the ecological indicator values for moisture (after Borhidi 1995): LBA Feudvar

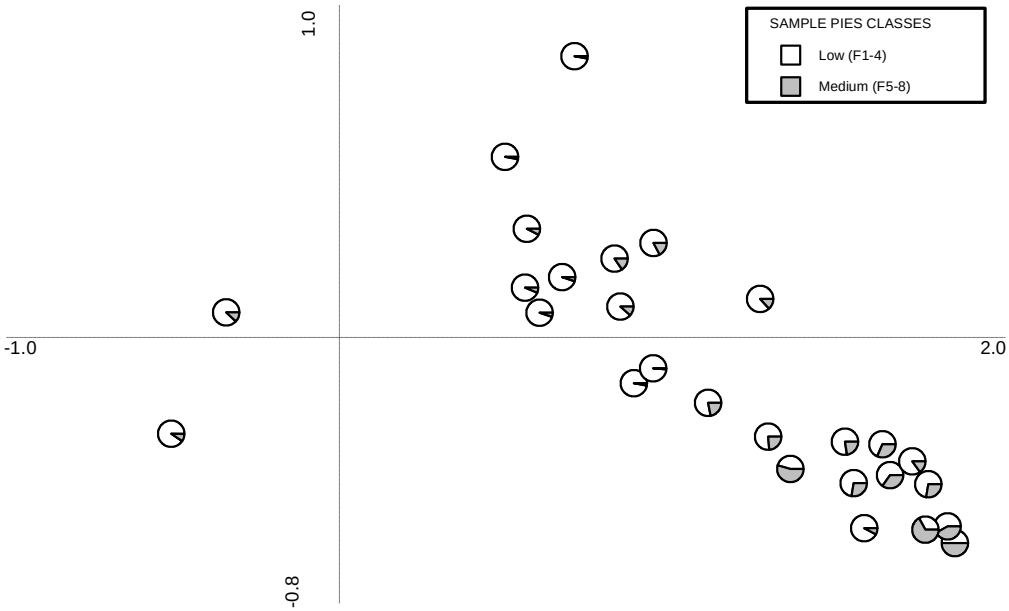


Fig 7.84. Correspondence analysis of the proportion of weed species, without TRITAED, CHENSPE, SECACEG AND PANMIL, according to their moisture indicator value for samples identified as unsieved products (after Borhidi 1995): LBA Feudvar

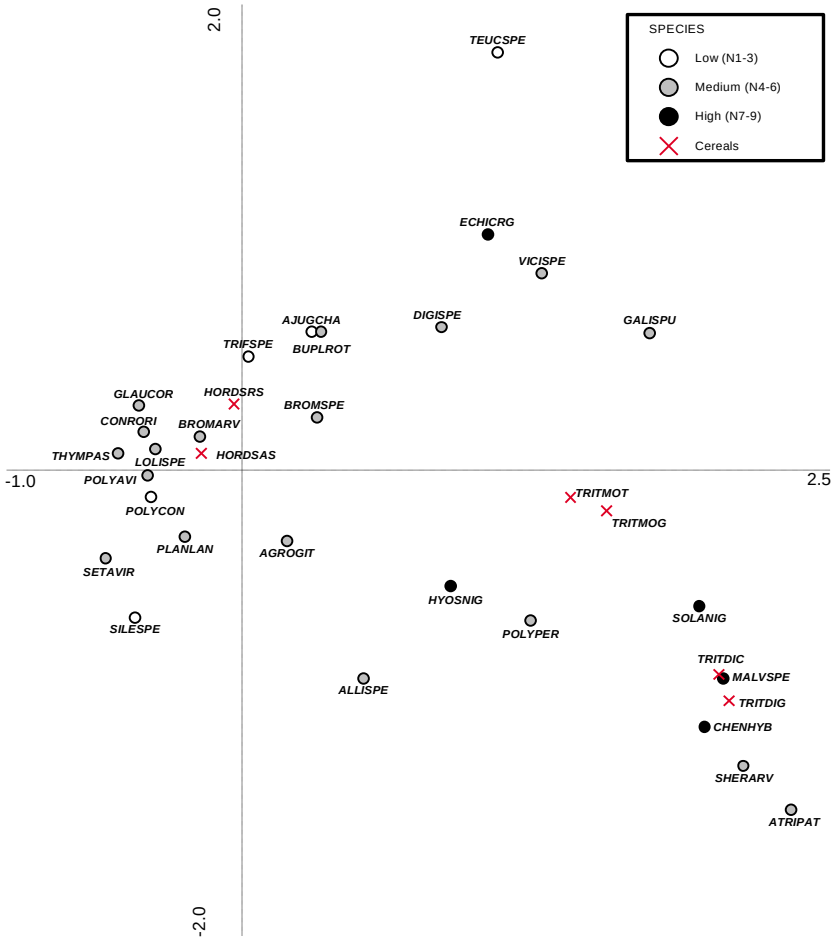


Fig 7.85. Correspondence analysis of crops and weed species, without TRITAED, CHENSPE, SECACEG AND PANMIL, for samples identified as unsieved products showing the ecological indicator values for nitrogen (after Borhidi 1995): LBA Feudvar

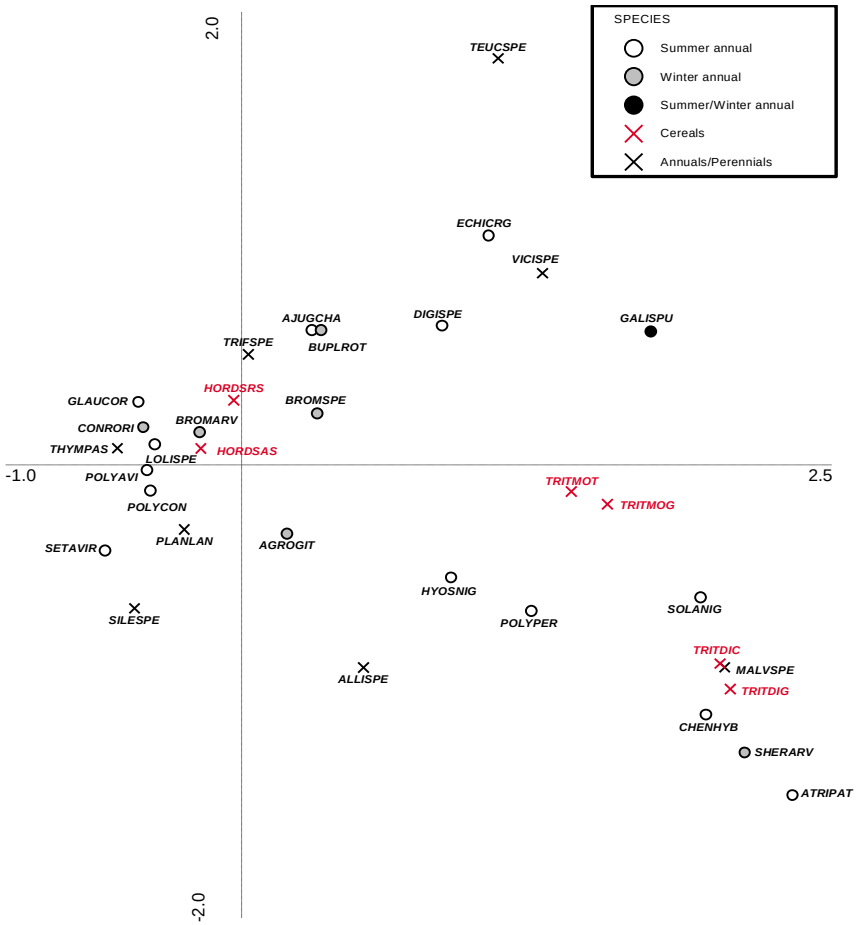


Fig 7.86. Correspondence analysis of crops and weed species , without TRITSPL, TRITAED, CHENSPE, SECACEG AND PANMIL, for samples identified as unsieved fine sieving by-products showing the germination time of each weed (after Bojňanský and Fargašová 2007): LBA Feudvar

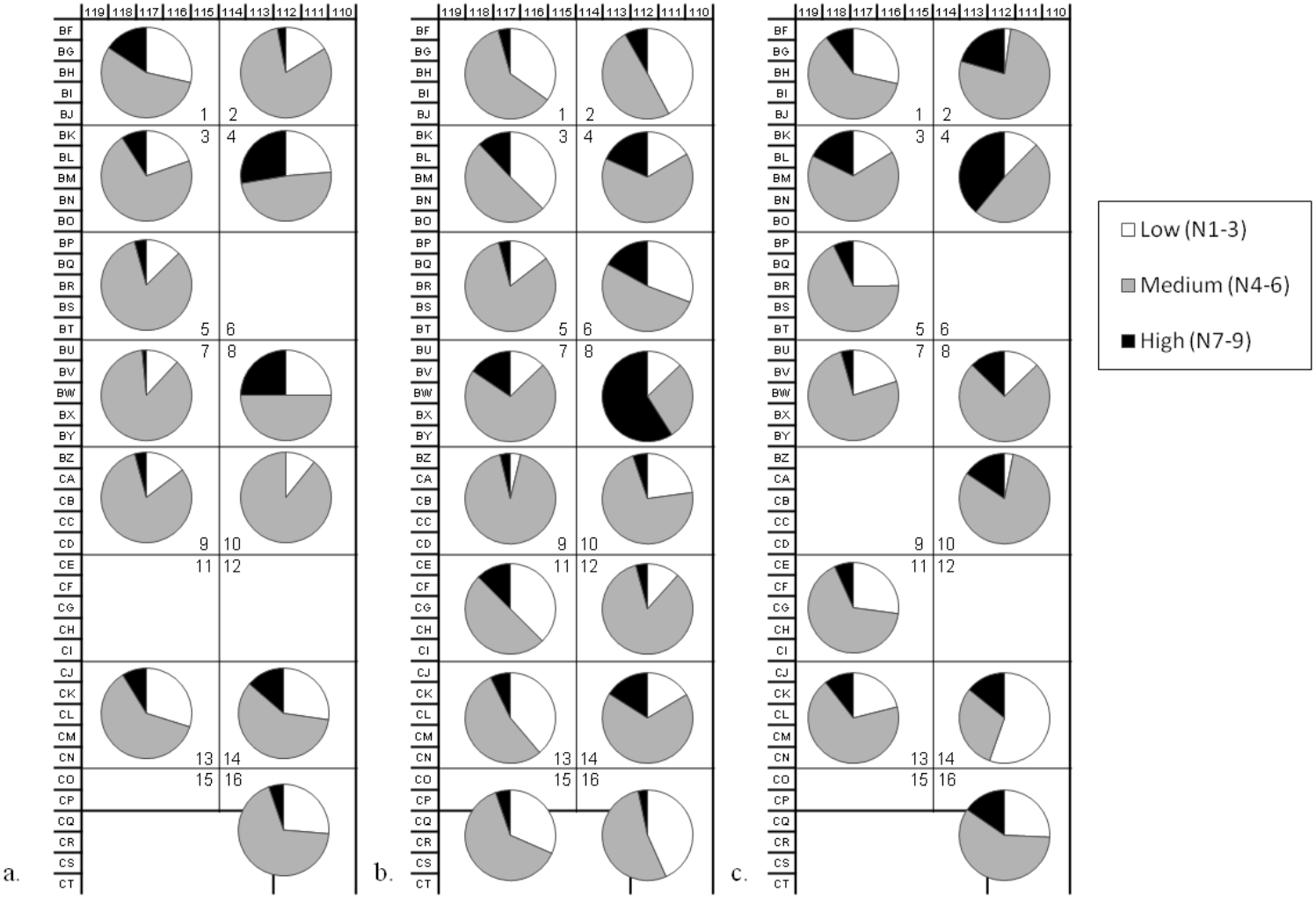


Fig 7.87. Pie charts representing the percentage of low, medium and high nitrogen indicator weed species for samples identified as a. unsieved spikelets, b. unsieved fine sieving by-products and c. unsieved products per 5x5m area: LBA Feudvar

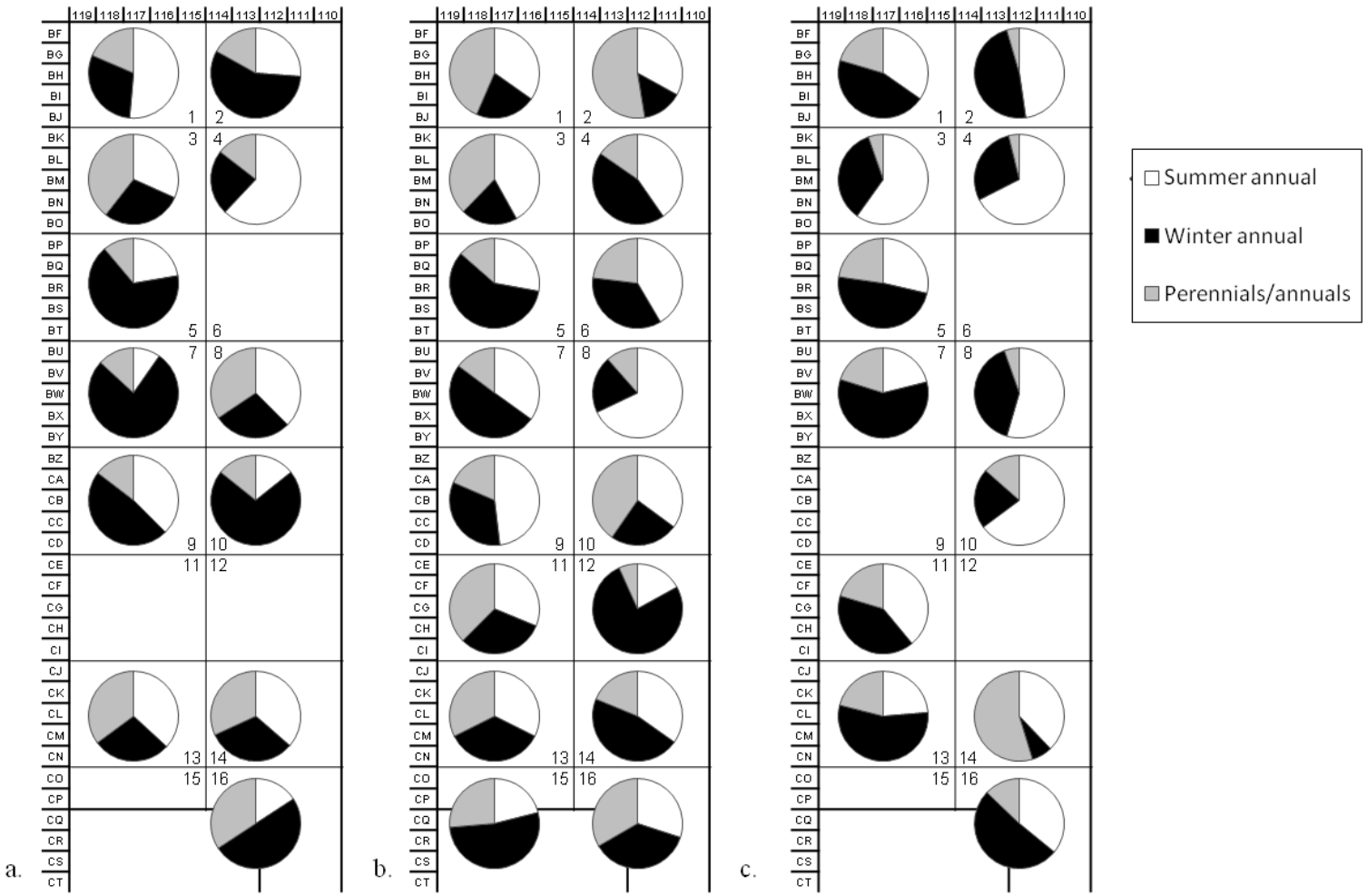


Fig 7.88. Pie charts representing the percentage of summer annuals, winter annuals and perennial/annuals for samples identified as a. unsieved spikelets, b. unsieved fine sieving by-products and c. unsieved products per 5x5m area: LBA Feudvar

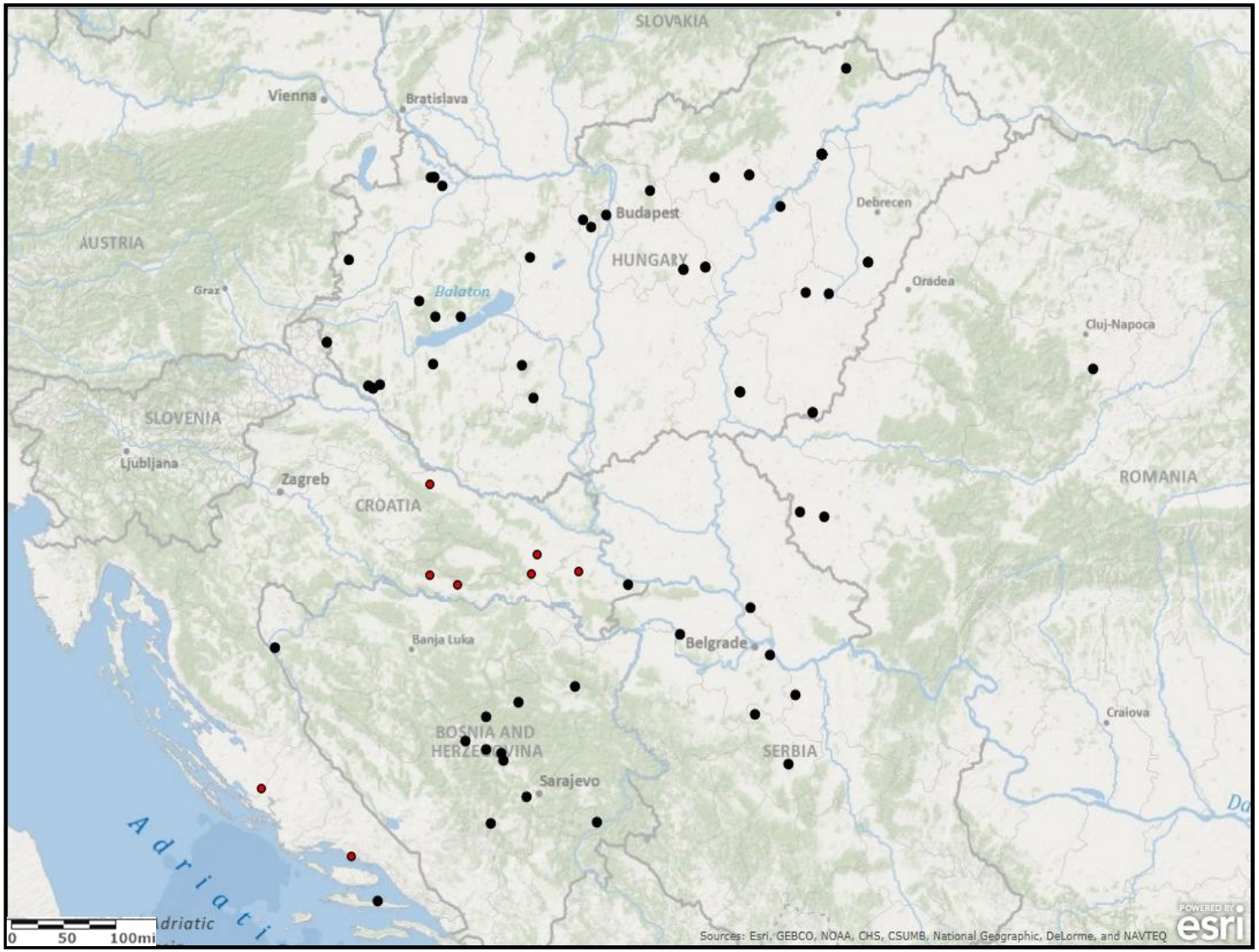


Fig 8.1. Map of sites with archaeobotanical material dating to the Mid/Late Neolithic in the Carpathian Basin. (Red = Croatian study sites)

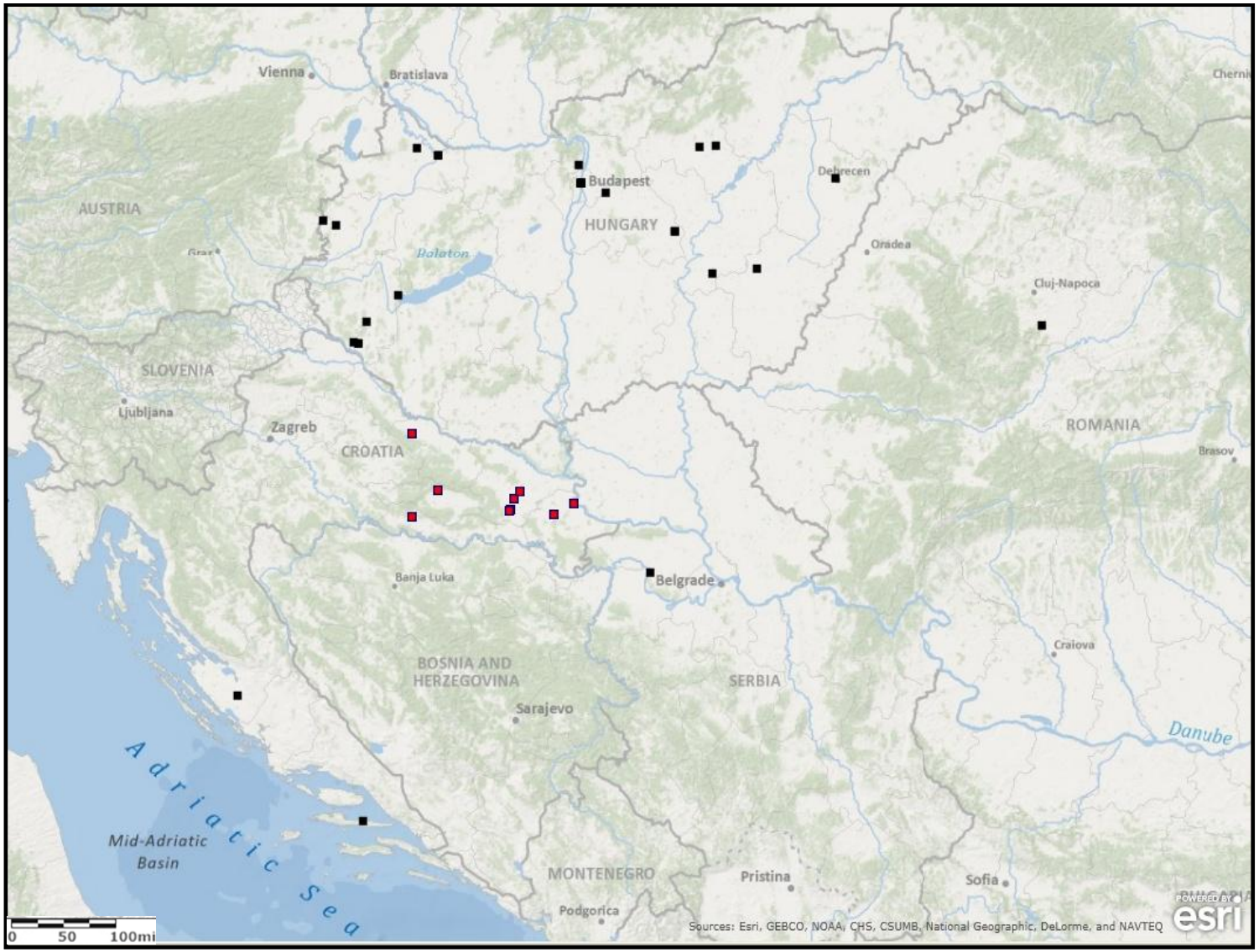


Fig 8.2. Map of sites with archaeobotanical material dating to the Copper Age in the Carpathian Basin. (Red = Croatian study sites)

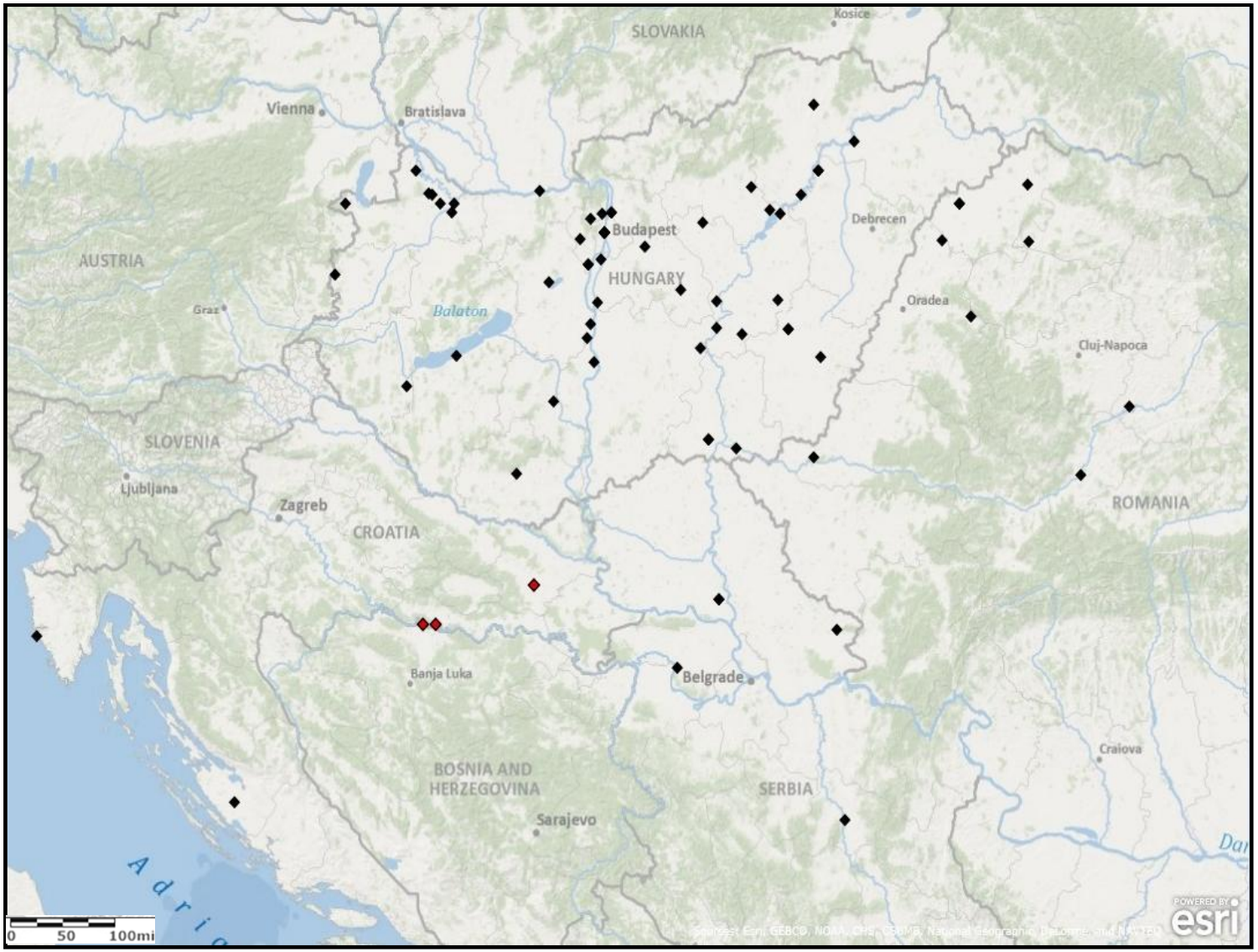


Fig 8.3. Map of sites with archaeobotanical material dating to the Bronze Age in the Carpathian Basin. (Red = Croatian study sites)

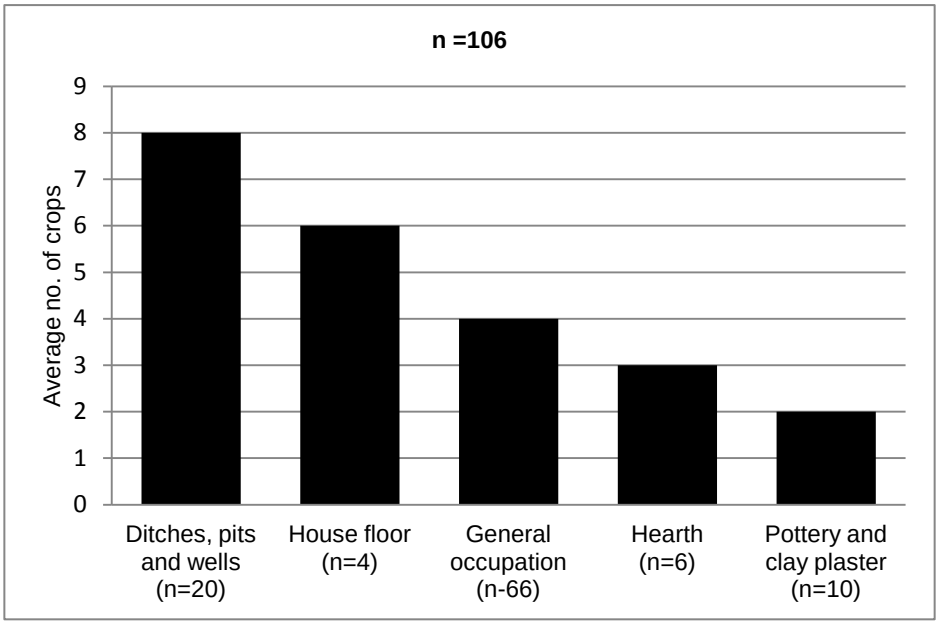


Fig 8.4. Average number of carbonised crop species recovered from each main feature type: Carpathian Basin

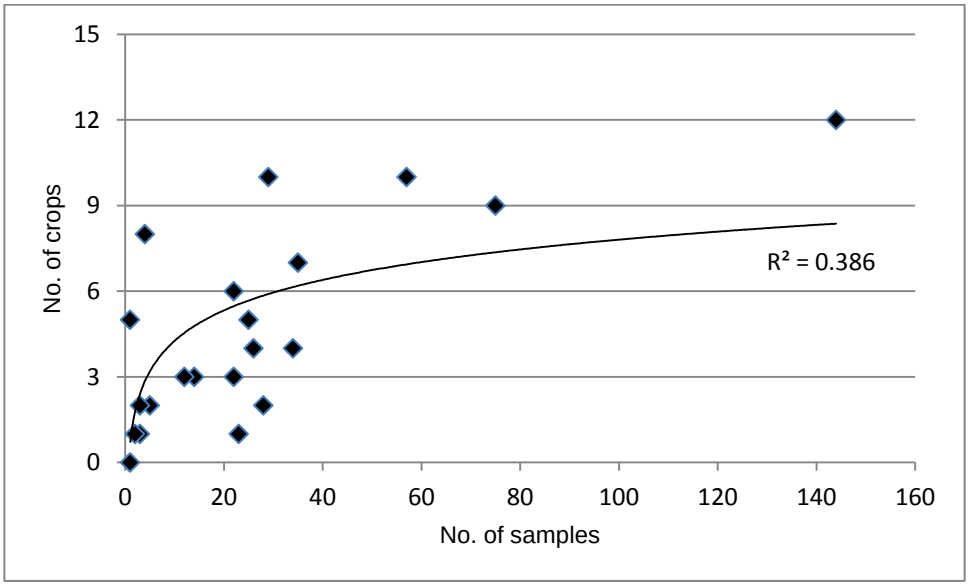


Fig 10.1. Correlation between number of samples and number of crops for all 18 Croatian sites including r^2 value

TABLES

5230 – 4750 BC	Mixed deciduous floodplain forest dominated by *Quercus robur* and *Fraxinus angustifolia*; coppiced lakeshore of *Corylus avellana* stand and possibly *Ulmus* trees.
4750 – 3810 BC	Mixed deciduous-coniferous floodplain forest of *Quercus robur*, *Corylus avellana*, *Ulmus*, *Picea abies*, *Carpinus betulus* and *Fraxinus angustifolia*.
3810 – 1735 BC	Mixed deciduous floodplain woodland dominated by *Corylus avellana*, *Ulmus* and *Quercus robur*; gradual spread of *Carpinus betulus* and *Fagus sylvatica* in the floodplain; *Alnus* fen-woods expand around the lake.
1735 - 620 BC	*Carpinus betulus* - *Quercus robur* woodland with the admixture of *Fagus sylvatica*. Anthropogenic woodland clearances, grazing and pastureland.

Table 2.1. Pollen record from Báb-tava northeast Hungary (Magyari *et al.* 2008: 37, Table 3)

	Greece	Bulgaria	Albania	Romania	Serbia	Bosnia Herzegovina	Croatia	Slovenia	Hungary
No. of sites	19	5	1	2	7	9	1	4	24
Hordeum vulgare	+	+	+	+	+	+	.	+	+
T. monococcum	+	+	+	+	+	+	+	+	+
Triticum dicoccum	+	+	+	+	+	+	.	+	+
T. aestivum/durum/compactum	+	+	.	.	+	+	.	.	+
Triticum spelta	.	.	.	.	.	.	.	.	+
'New' glume wheat	+	.	.		.	.	.	.	+
Panicum miliaceum	.	+	.	+	+	+	.	.	+
Setaria italica	.	.	.	.	.	.	.	.	+
Secale cereale	+	.	.	.	.	.	.	.	+
Avena sativa	.	.	.	.	.	.	cf.	.	.
Lathyrus sativus	+	+	.	.	+	.	.	+	+
Lens culinaris	.	.	.	+	+	.	.	.	+
Pisum sativum	+	+	.	+	+	+	.	+	+
Vicia ervilia	+	+	+	+	+	.	.	.	+
Vicia faba	+	.	.	.	.	.	.	.	+
Cicer arietinum		.	.	.	.	.	.	.	.
Linum usitatissimum	+	.	.	.	.	+	.	+	+
Camelina sativa	.	.	.	.	.	.	.	.	+
Vitis vinifera ssp. silvestris	+	.	.	.	.	.	.	+	+

Table 2.2. Presence of crop remains recovered from Late Neolithic sites in Southeast Europe

	Greece	Albania	Bulgaria	Romania	Serbia	Bosnia Herzegovina	Croatia	Slovenia	Hungary
No. of sites	7	-	29	1	1	-	2	2	26
Hordeum vulgare	+	.	+	.	+	.	.	.	+
T. monococcum	+	.	+	+	+	.	+	.	+
Triticum dicoccum	+	.	+	+	+	.	+	.	+
T. aestivum/durum/compactum	+	.	+	+	+	.	.	+	+
Triticum spelta	.	.	+	+	.	.	.	.	+
'New' glume wheat	+	.	.	.	.	.	.	.	.
Panicum miliaceum		.	+	+	+	.	.	+	+
Setaria italica	+	.	.	.	.	.	cf.	.	.
Secale cereale	.	.	.	+	.	.	.	.	+
Avena sativa	.	.	.	.	.	.	.	.	.
Lathyrus sativus	+	.	.	.	+	.	.	.	.
Lens culinaris	.	.	+	.	+	.	.	.	+
Pisum sativum	+	.	+	.	+	.	.	.	+
Vicia ervilia	+	.	+	.	+	.	.	.	.
Vicia faba	.	.	.	.	.	.	.	.	.
Cicer arietinum	.	.	+	.	.	.	.	.	.
Linum usitatissimum	+	.	+	.	+	.	.	.	+
Camelina sativa	.	.	.	.	.	.	.	.	.
Vitis vinifera ssp. silvestris	+	.	.	.	.	.	.	+	+

Table 2.3. Presence of crop remains recovered from Copper Age sites in Southeast Europe

	Greece	Albania	Bulgaria	Romania	Serbia	Bosnia Herzegovina	Croatia	Slovenia	Hungary
No. of sites	27	-	8	8	2	-	2	2	56
Hordeum vulgare	+	.	+	+	+	.	+	+	+
T. monococcum	+	.	+	+	+	.	+	+	+
Triticum dicoccum	+	.	+	+	+	.	.	.	+
T. aestivum/durum/compactum	+	.	+	+	+	.	.	+	+
Triticum spelta	+	.	+	+	+	.	.	.	+
'New' glume wheat	+	.	.	.	+	.	.	.	.
Panicum miliaceum	+	.	+	+	+	.	.	+	+
Setaria italica	+	.	.	.	+	.	.	.	+
Secale cereale	+	.	+	+	cf.	.	.	.	+
Avena sativa	.	.	.	.	.	.	.	+	.
Lathyrus sativus	+	.	+	.	+	.	.	.	+
Lens culinaris	+	.	+	+	+	.	+	+	+
Pisum sativum	+	.	+	+	+	.	.	.	+
Vicia ervilia	+	.	+	+	+	.	.	.	+
Vicia faba	+	.	.	+	+	.	+	+	+
Cicer arietinum	+	.	.	.	+	.	.	.	+
Linum usitatissimum	+	.	.	.	+	.	.	.	+
Camelina sativa	+	.	.	.	+	.	.	.	+
Vitis vinifera ssp. silvestris	+	.	.	.	+	.	+	+	+

Table 2.4. Presence of crop remains recovered from Bronze Age sites in Southeast Europe

Full site name	Period	Site type	No. of Samples	Average sample size	Recovery method	Sieve size	Features sampled	Representativeness
Virovitica-Brekinja	MN	Flat	5	11	MF	1mm	Pits	4
Ivandvor-Gaj	LN	Flat	14	11	MF	1mm	Pits	4
Čista Mala -Velištak	LN	Flat	34	11	BF	250µm	Multiple	3
Turska Peć	LN	Cave	22	11	BF	250µm	Multiple	3
Sopot	LN	Tell	144	20	MF	250µm	Multiple	2
Ravnjaš-Nova Kapela	LN	Tell	57	11	BF	250µm	Multiple	4
Slavča	LN, LN/CA, CA	Tell	24 51 22	11	BF	250µm	Pits	4
Đakovo-Franjevac	CA	Flat	29	11	MF	1mm	Pits	4
Pajtenica-Velike Livade	CA	Flat	23	11	MF	1mm	Pits	4
Potočani	CA	Flat	1	11	MF	1mm	Pits	4
Jurjevac-Stara Vodenica	CA	Flat	12	11	MF	1mm	Pits	4
Tomašanci-Palača	LN, CA, EBA	Flat	1 26 28	11	MF	1mm	Pits	4
Vučedol	CA	Tell	35	11	MF	1mm	Pits	4
Vinkovci/Matije Gupca 14	CA	Flat	4	11	MF	250µm	Pits	4
Virovitica-Batelije	CA	Flat	3	11	MF	1mm	Multiple	3
Crišnjevi-Oštrov	LBA	Necropolis	3	11	BF	250µm	Pits	4
Orubica-Veliki Šeš	LBA	Flat	2	11	BF	250µm	Pits	4
Mačkovac-Crišnjevi	LBA	Flat	25	11	BF	250µm	Multiple	3
Feudvar	LBA	Tell	524	10	BF	300µm	Multiple	2

Table 3.1. Summary of sampling, recovery and representativeness of the samples from each site Abbreviations: MN = Middle Neolithic, LN = Late Neolithic, CA = Copper Age, EBA = Early Bronze Age, LBA = LBA. Machine flotation (MF), bucket flotation (BF). (Representativeness: see Methodology, pp. 36)

Site code	**Full site name**	C14 dates (cal BC)	Cultural group	Reference
VIRBRE	Virovitica-Brekinja	5400-5200	Late Starčevo	Sekelj-Ivančan and Balen 2006
IVAGAJ	Ivandvor-Gaj	5050-4780 4730-4490	Sopot	Balen *et al.* 2009; Lipovac Vrkljan and Šiljeg 2006
CISMAV	Čista Mala -Velištak	4900-4700	Hvar	Podrug 2010
TURPEC	Turska Peć	-	Hvar	Kliškić 2006a, b, 2007
SOPOT	Sopot	5050-4550 4790-4320 4340-3940	Sopot	Škrivanko 2003, 2003, 2011
RAVNJA	Ravnjaš-Nova Kapela	-	Sopot	Mihaljević 2006a, 2007b, 2008a
SLAVCA	Slavča	-	Sopot, Lasinja, Kostolac, Vučedol	Mihaljević 2004, 2005, 2006b, 2007c, 2008b, 2009
TOMPAL	Đakovo-Franjevac	4300-3900 3700-3600	Sopot, Lasinja, Baden, Retz-gajary, Kostolac, Vinkovačka	Balen 2008c
ĐAKFRA	Pajtenica-Velike Livade	3300-2700	Kostolac	Balen 2007a, 2008a, 2011
JURSTV	Potočani	4320-3960	Lasinja	Balen 2008a
PAJVEL	Jurjevac-Stara Vodenica	4350-3540	Lengyel	Balen 2006a
POTOCA	Tomašanci-Palača	4200	Lasinja	Balen 2007b
VUCEDO	Vučedol	2900-2600	Vučedol	Balen 2004, 2005b, 2007c, 2008b
VINMAG	Vinkovci/Matije Gupca 14	-	Vučedol	Krznarić Škrivanko 2007; Miloglav 2007
VIRBAT	Virovitica-Batelije	3700-3400	Retz-gajary/Boleraz	Balen 2006b
MACCRI	Mačkovac-Crišnjevi	-	Barice-Gređani	Karavanić *et al.* 2002
CRIOST	Crišnjevi-Oštrov	-	Barice-Gređani	Mihaljević and Kalafatić 2005, 2008, 2009; Mihaljević 2007a
ORUVES	Orubica-Veliki Šeš	-	13th-12th century BC	Mihaljević and Kalafatić 2007

Table 4.1. Summary of Croatian sites with associated C14 dates and cultural groups

Total no. of sites	18
Total no. of samples	565
Total volume (litres)	7,826
Total no. of seed items (not including indet. frags)	18,910
Mean seed density per litre	2.4
Median seed density per litre	0.6
St. deviation	6.9

Table 4.2. Summary statistics for the 18 Croatian sites

	Mid- Late Neolithic	Copper Age	Bronze Age
No. of sites	8	9	4
No. of samples	352	155	58
Volume floated (l)	5,240	1,915	671
No. of identified seeds	14,052	4,385	472
No. of crops	14	13	10
Mean seed density per litre	3.1	1.7	0.7
Median seed density per litre	0.5	0.5	0.1
St. deviation	19	4.6	3

Table 4.3. Summary statistics of the Croatian sites per period

Site code	Total number of samples	Total volume sampled (l)	Mean charcoal density (cm^3/l)	Total no. of seed items (not inc. indet. frags)	Mean seed density per litre	Median seed density per litre	St. deviation	Feature type
VIRBRE	5	55	-	15	0.3	0.1	0.4	Pits only
IVAGAJ	14	154	0	22	0.1	0.1	0.2	Pits only
CISMAV	34	268	0.4	152	0.7	0.2	2.2	Multiple
TURPEC	22	304	1.3	5,391	21	2	74	Occupation levels
SOPOT	144	2,842	0.2	2,581	0.9	0.3	2	Multiple
SLAVCA	75	825	0.6	3,718	4.5	1.5	7.5	Multiple
RAVNOK	57	627	0.3	2,176	3.5	1.5	6.8	Multiple
TOMPAL	1	11	0	1	0.2	0.2	0	Pits only

Table 4.4. Summary table of the charcoal and seed densities per litre for each site: Middle/late Neolithic Croatia

Site code	Total number of samples	Total volume sampled (l)	Total no. of seeds (not inc. indet.)	Grain	Chaff	Pulse	Oil plant	Fruit	Wild/weed
VIRBRE	5	55	15	0.1	0	0	0	0	0
IVAGAJ	14	154	22	0.1	0	0	0	0	0
CISMAV	34	268	152	0.1	0	0	0	0	0
TURPEC	22	304	5,391	0	0	0	0	0	0.6
SOPOT	144	2,842	2,581	0.2	0.1	0	0	0	0
SLAVCA	75	825	3,718	0.1	1.4	0	0	0	0
RAVNOK	57	627	2,176	0.3	0.6	0	0	0	0
TOMPAL	1	11	1	0	0	0	0	0.1	0

Table 4.5. Summary table of the median seed densities (per litre) for each plant category per site: Mid/Late Neolithic Croatia

Site code	Total number of samples	Total volume sampled (l)	Mean charcoal density (cm^3/l)	Total no. of seed items (not inc. indet. frags)	Mean seed density per litre	Median seed density per litre	St. deviation	Feature type
ĐAKFRA	29	302	1	275	1	0.7	1	Pits only
JURSTV	12	132	0.1	50	0.4	0.3	0.4	Pits only
PAJVEL	23	253	0.06	25	0.1	0.1	0.1	Pits only
POTOCA	1	55	-	70	1	1	-	Pits only
SLAVCA	22	242	1.1	466	1.9	1.5	1.7	Pits only
TOMPAL	27	297	0.1	188	0.7	0.2	1.2	Pits only
VINMAG	4	216	2	1,734	8	8	3	Pits only
VIRBAT	3	33	-	14	0.4	0.4	0.5	Pits only
VUCEDO	35	385	1	1,580	4	1	9	Multiple

Table 4.6. Summary table of the charcoal and seed densities per litre for each site: Copper Age Croatia

Site code	Total number of samples	Total volume sampled (l)	Total no. of seeds (not inc. indet.)	Grain	Chaff	Pulse	Oil plant	Fruit	Wild/weed
ĐAKFRA	29	302	275	0.5	0	0	0	0	0.1
JURSTV	12	132	50	0.2	0	0	0	0	0
PAJVEL	23	253	25	0.1	0	0	0	0	0
POTOCA	1	55	70	1	0.1	0.02	0	0	0.02
SLAVCA	22	242	466	0.2	1.1	0	0	0	0
TOMPAL	27	297	188	0.2	0	0	0	0	0
VINMAG	4	216	1,734	2	0	0	0.2	0.03	6
VIRBAT	3	33	14	0.1	0.2	0	0	0	0
VUCEDO	35	385	1,580	0.6	0	0	0	0	0.2

Table 4.8. Summary table of the median seed densities (per litre) for each plant category per site: Copper Age Croatia

Site code	Total number of samples	Total volume sampled (l)	Mean charcoal density (cm^3/l)	Total no. of seed items (not inc. indet. frags)	Mean seed density per litre	Median seed density per litre	St. deviation	Feature type
CRIOST	3	33	0.2	20	0.6	0.3	0.7	Occupation levels
MACCRI	25	275	0.9	412	1.5	0.2	5	Multiple
ORUVES	3	33	0.1	4	0.2	0.2	0.5	Pits only
TOMPAL	28	308	-	36	0.1	0	0.2	Pits only

Table 4.9. Summary table of the charcoal and seed densities per litre for each site: Bronze Age Croatia

Site code	Total number of samples	Total volume sampled (l)	Total number of seeds (not inc. indet.)	Grain	Chaff	Pulse	Oil plant	Fruit	Wild/weed
CRIOST	3	33	20	0.1	0	0	0	0	0
MACCRI	25	275	412	0	0	0	0	0	0
ORUVES	3	33	4	0	0	0	0	0	0
TOMPAL	28	308	36	0	0	0	0	0	0

Table 4.11. Summary table of the median seed densities (per litre) for each plant category per site: Bronze Age Croatia

Site code	Period	Preservation class						**Total no. samples**
		1	2	3	4	5	N/A	
VIRBRE	MN	-	-	-	1	2	2	**5**
IVAGAJ	LN	-	-	1	-	7	6	**14**
CISMAV	LN	1	-	5	10	10	8	**34**
TURPEC	LN	-	4	7	6	4	1	**22**
SOPOT	LN	-	2	7	21	107	7	**144**
RAVNOK	LN	-	1	11	20	23	2	**57**
TOMPAL	LN	-	-	-	1	-	-	**1**
SLAVCA	LN/CA	-	6	6	27	29	7	**75**
SLAVCA	CA	-	3	2	8	7	2	**22**
PAJVEL	CA	-	-	1	3	12	7	**23**
POTOCA	CA	-	-	-	-	1	-	**1**
JURSTV	CA	-	-	-	-	8	4	**12**
TOMPAL	CA	-	-	1	2	16	7	**26**
ĐAKFRA	CA	-	-	1	6	19	3	**29**
VIRBAT	CA	-	-	-	1	2	-	**3**
VINMAG	CA	-	-	2	2	-	-	**4**
VUCEDO	CA	-	2	10	10	12	1	**35**
TOMPAL	EBA	-	1	-	3	14	10	**28**
MACCRI	LBA	1	2	2	5	4	11	**25**
CRIOST	LBA	-	-	-	3	-	-	**3**
ORUVES	LBA	-	-	-	2	-	-	**2**
Total no. samples		**2**	**21**	**56**	**131**	**277**	**78**	**565**

Table 4.12. Summary of samples identified to a preservation class per site: All 18 Croatian sites

NB: Preservation classes per sample. All classes based on >50% of the whole identified plant remains from a sample (including indet frag) being allocated to one class. 1= Perfect, 2= epidermis virtually intact (>75% epidermis present), 3=epidermis incomplete (>25% <75% epidermis present), 4=fragments of epidermis remaining (<25% epidermis), 5= identifiable by gross morphology only, N/A= no seed remains present in sample. (See Chapter 3 for more details).

	1	2	3	4	5	N/A
Tell/cave	0%	5%	13%	27%	54%	2%
Flat	1%	2%	9%	26%	63%	10%

Table 4.14. Percentage of samples identified to a preservation class per site type: All 18 Croatian sites

Density	0-5	5.1-10	10.1-25	25.1+	No. of samples
No. of samples	519	22	16	8	565
Feature type					
Ditch (inc. canal)	95%	-	5%	-	38
General occupation layer	93%	2%	2%	2%	122
Hearth	89%	11%	-	-	9
House area (inc. floor)	89%	5%	3%	3%	73
Outside House	100%	-	-	-	5
Pit (inc. hole, mass grave pit)	91%	5%	3%	1%	317
Pot fill	100%	-	-	-	1

Table 4.15. Percentage of samples from each feature type per density group: All 18 Croatian sites

Feature type	Period	Sample no.	Grain density	Chaff density	Pulse density	Oil plant density	Fruit density	Wild/weed density	Dominant component
General occupation layer	LN	TPEC01	0	0	0	0	0	347	Weed
General occupation layer	LN	TPEC02	0	0	0	0	0	31	Weed
General occupation layer	LN	TPEC03	0	0	0	0	0	41	Weed
Pit	LN	SLAV37	1	27	0	0	0	0	Chaff
Pit	LN	SLAV30	4	38	0	0	0	0	Chaff
Pit	LN	SLAV70	4	48	0	0	0	0	Chaff
House	CA	VUCE10	29	0	0	0	0	0	Grain
House	CA	VUCE21	39	0	0	0	0	1	Grain

Table 4.16. Samples from the Croatian sites with >25.1 seed density (per litre) and details of the dominant component of each sample

Feature types	Grain	Chaff	Pulses	Oil plants	Fruits	Wild/weed	Total no. of seeds
Ditch	30%	54%	0.2%	0.1%	2%	14%	1,013
General occupation layer	23%	5%	1%	0.1%	1%	70%	7,516
Hearth	83%	2%	1%	-	3%	11%	152
House	80%	6%	1%	0.2%	7%	7%	2,088
Outside House	68%	30%	-	-	-	2%	44
Pit	21%	58%	1%	1%	1%	18%	8,098

Table 4.17. Percentage of seeds identified to each plant category per feature type: All 18 Croatian sites

Site code	CISMAV	IVAGAJ	RAVNOK	SLAVCA	SOPOT	TOMPAL	TURPEC	VIBBRE	Total frequency
No. of samples	34	14	57	75	144	1	22	5	352
GRAIN									
Hordeum vulgare hulled					1%		18%		2%
Hordeum vulgare var. *nudum*	18%		14%	12%	8%				10%
Triticum dicoccum	9%	14%	47%	13%	23%		41%		24%
Triticum monococcum	24%	14%	39%	9%	22%		14%	20%	21%
T. monococcum 2-g			4%		1%				1%
Triticum mono/dicoc	6%		14%		19%		5%	20%	11%
Triticum spelta			12%		3%		9%		4%
Triticum cf. *spelta*							5%		0.3%
T. aestivum/durum			2%	3%	2%		9%		2%
T. spelta/new glume wheat				3%					1%
Triticum spp.		21%	53%	21%	35%		27%	20%	30%
Secale cereale			2%	3%	2%		5%		2%
Secale cf. *cereale*					2%				1%
cf. *Secale* sp.	3%								0.3%
Avena sp.	3%		2%		3%				2%
Cerealia indet.	35%	29%	72%	47%	76%		36%	20%	60%
Panicum miliaceum			2%						0.3%
cf. *Panicum miliaceum*							5%		0.3%
Setaria italica				1%					0.3%
CHAFF									
Hordeum vulgare rachis				3%	2%				1%
T. dicoccum g/b	3%		18%	21%	10%		5%		12%
T. monococcum g/b	6%		5%	20%	8%				9%
T. mono/dicoc/ 'new' g/b	15%	7%	2%	11%	2%				5%
Triticum spelta g/b			4%	4%	1%		5%		2%
cf. Triticum spelta g/b					1%				1%
"New glume wheat" g/b	3%		2%	8%	1%				3%
cf. *"New glume wheat"* g/b					1%				1%
Triticum sp. g/b	6%		84%	80%	54%		14%		54%
T.aestivum/durum rachis				1%					0.3%
Cerealia rachis			2%	4%	1%				2%
PULSES									
Lathyrus sativus					1%		9%	20%	1%
Lens culinaris	6%	14%	14%	1%	3%		5%		5%
cf. *Lens culinaris*					3%				1%
Pisum sativum			9%	1%	2%				3%
Pisum cf. *sativum*					1%				1%
Vicia ervilia				3%			5%		1%
Large legumes indet.	6%	7%		11%	8%			20%	7%
OIL PLANTS									
Linum usitatissimum				3%	6%				3%
Linum sp.	3%								0.3%
FRUITS									
Cornus mas				5%	3%	100%			3%
Physalis alkekengi				3%	23%				10%

Table 4.18. Frequency of species per site: Mid-Late Neolithic Croatia

Site code	CISMAV	IVAGAJ	RAVNOK	SLAVCA	SOPOT	TOMPAL	TURPEC	VIBBRE	Total frequency
No. of samples	34	14	57	75	144	1	22	5	352
Prunus sp.							5%		0.3%
Rosa sp.							5%		0.3%
Rosa canina	3%								0.3%
Rubus fruticosus			2%				5%		1%
Sambucus ebulus			2%		3%				1%
Indet Fruit				3%	1%				1%
WILD/WEED SPECIES									
cf. *Astragalus cicer*							55%		3%
Ajuga reptans			2%	1%					1%
Asteraceae				3%	1%				1%
Bromus sp.				5%	29%				13%
Carex sp.							5%		0.3%
Cerastium sp.							9%		1%
Chenopodiaceae			2%	5%	22%		5%		11%
Chenopodium album				4%	1%		36%		3%
Chenopodium sp.				1%	1%				1%
Compositae				1%	1%				1%
Coronilla varia							5%		0.3%
Cyperaceae							9%		1%
Echinochloa crus-galli					1%				1%
Galium aparine				4%	1%				1%
Galium sp.	3%			3%			9%		1%
Gramineae large	9%			7%	16%		18%		10%
Gramineae small				3%	2%		5%		2%
Hyoscyamus sp.							9%		1%
Lolium sp.					1%				0.3%
Medicago sativa							9%		1%
Papaver sp.					1%				0.3%
Phleum sp.					1%				0.3%
Phalaris/Phleum sp.				1%					0.3%
Polygonum sp.			4%	3%	3%		5%		3%
Potentilla sp.			2%		2%				1%
Rumex sp.	3%						5%		1%
Rumex/Polygonum sp.				5%	8%		5%		5%
Setaria viridis				1%	1%		14%		1%
cf. *Sherardia arvensis*				1%					0.3%
small seeded legumes					1%		9%		1%
large seeded legume							18%		1%
Solanaceae				1%					0.3%
Solanum sp.							5%		0.3%
Teucrium sp.							9%		1%
Trifolium sp.					1%		27%		2%
Trigonella sp.							14%		1%
Urtica urens					1%				0.3%
Urtica dioica					1%				0.3%
Urtica sp.				1%					0.3%
INDETERMINATE	68%	43%	93%	81%	90%		82%	40%	83%

Table 4.18. (Continued)

Unique sample no.	ĐAKFRA	JURSTV	PAJVEL	POTOCA	SLAVCA	TOMPAL	VIRBAT	VINMAG	VUCEDO	Total frequency
No. of samples	29	12	23	1	22	26	3	4	35	155
GRAIN										
Hordeum vulgare hulled								75%	9%	4%
Hordeum vulgare var. *nudum*	10%		9%	100%		4%		100%	6%	8%
Triticum dicoccum	10%	25%		100%	18%	8%		100%	23%	16%
Triticum monococcum	41%			100%	18%	4%		100%	63%	28%
T. monococcum 2-g						4%			3%	1%
Triticum mono/dicoc	17%		4%		5%	4%		100%	23%	13%
Triticum spelta								100%	3%	3%
Triticum cf. *spelta*									3%	1%
T. aestivum/durum	3%					4%		50%	3%	3%
Triticum spp.	24%		4%	100%	32%	12%	33%	100%	49%	26%
Secale cereale				100%				25%		1%
Cerealia indet.	90%	58%	48%	100%	64%	62%	33%	100%	71%	68%
Panicum miliaceum	3%							50%		1%
Setaria italica				100%					6%	2%
CHAFF										
T. dicoccum g/b		8%		100%	18%	8%	33%			6%
T. monococcum g/b	7%				32%	4%	33%		14%	10%
T. mono/dicoc/ 'new' g/b	7%				23%				9%	6%
Triticum spelta g/b		8%			5%					1%
Triticum sp. g/b	3%	17%		100%	73%	23%	33%	25%		18%
T.aestivum/durum rachis		0%							3%	1%
Cerealia rachis					5%	4%				1%
Straw					5%					1%
PULSES										
Lathyrus sativus	3%									1%
Lens culinaris	3%									1%
cf. *Lens culinaris*										
Pisum sativum	17%								11%	6%
Vicia ervilia										
Large legumes indet.	10%			100%				25%	3%	4%
OIL PLANTS										
Linum usitatissimum	10%							100%	14%	8%
Linum cf. *usitatissimum*					5%					1%
Linum sp.										
FRUITS										
Cornus mas	14%	8%			9%	12%		25%		7%
Corylus sp.						4%				1%
Physalis alkekengi	21%				9%	8%		50%	3%	8%
Prunus cf. *spinosa*		8%								1%
Rubus fruticosus	7%				5%					2%
Rubus sp.	3%									1%
Sambucus ebulus	7%					8%		25%	9%	5%
Indet Fruit	3%					8%				2%

Table 4.19. Frequency of species per site: Copper Age Croatia

Unique sample no.	ĐAKFRA	JURSTV	PAJVEL	POTOCA	SLAVCA	TOMPAL	VIRBAT	VINMAG	VUCEDO	Total frequency
No. of samples	29	12	23	1	22	26	3	4	35	155
WILD/WEED SPECIES										
Ajuga reptans									3%	1%
Agrostemma githago	3%							50%	11%	5%
Asteraceae								25%		1%
Bromus sp.	21%				9%	4%		100%	26%	14%
Carex sp.					9%	4%		25%	3%	3%
cf. *Carpinus betulus*	3%									1%
Chenopodiaceae/Caryophylaceae									3%	1%
Chenopodium sp.					5%			25%		1%
Chenopodium album	7%							100%	3%	5%
cf. *Convolvulus arvensis*									3%	1%
Cyperaceae								25%		1%
Festuca sp.									3%	1%
Galium aparine						8%		25%	3%	3%
Galium sp.	7%		4%			4%			3%	3%
Gramineae large	14%		9%	100%	5%	8%		100%	26%	15%
Gramineae small	3%							50%	6%	3%
Hypericum sp.								25%	3%	1%
Lolium sp.	3%							25%	3%	2%
Mentha sp.									3%	1%
Phalaris sp.									9%	2%
Phalaris/Phleum sp.									3%	1%
Phleum sp.	3%							50%	9%	4%
Plantago lanceolata									3%	1%
Plantago sp.									3%	1%
Poa sp.									3%	1%
Polygonum sp.	14%				5%			50%	11%	7%
Polygonum aviculare									3%	1%
Potentilla sp.					5%			25%	3%	2%
Rumex sp.									3%	1%
Rumex/Polygonum sp.	10%									2%
Setaria viridis	7%				5%				9%	4%
Silene sp.	3%								6%	2%
Salvia sp.									3%	1%
small seeded legumes	7%							100%	3%	5%
Solanaceae	3%									1%
Teucrium sp.	3%							25%	14%	5%
Teucrium chamaedrys									9%	2%
Trifolium sp.									9%	2%
Urtica sp.									3%	1%
Verbena officinalis								25%		1%
Viola sp.					5%			25%		1%
INDETERMINATE	90%	67%	57%	100%	86%	62%	100%	1	83%	77%

Table 4.19. (Continued)

Unique sample no.	MACCRI	CRIOST	ORUVUS	TOMPAL	Total frequency
No. of samples	25	3	2	28	58
GRAIN					
Hordeum vulgare var. *nudum*				4%	2%
Triticum dicoccum	4%				2%
Triticum mono/dicoc				4%	2%
T. aestivum/durum				4%	2%
Triticum spp.	4%				2%
Avena sativa	20%				9%
Cerealia indet.	20%	33%		36%	28%
Panicum miliaceum	24%	67%	50%		16%
Setaria italica	8%				3%
CHAFF					
Triticum sp. g/b	4%				2%
Avena sativa floret base	8%				3%
Straw				4%	2%
PULSES					
Lens culinaris	4%				2%
FRUITS					
Cornus mas			50%	4%	3%
Prunus spinosa	8%				3%
Vitis vinifera				4%	2%
WILD/WEED SPECIES					
Bromus sp.	4%				2%
Carex sp.	8%		50%		5%
Chenopodiaceae	4%			4%	3%
Cyperaceae	4%				2%
Digitaria sanguinalis	4%	33%			3%
Gramineae large	16%	33%			9%
Gramineae small	8%				3%
Lamiaceae	4%				2%
Papaver sp.	4%				2%
Phleum sp.	4%			4%	3%
Plantago sp.	4%				2%
Polygonum sp.	16%	33%			9%
Prunella vulgaris	4%				2%
Scirpus sp.	4%				2%
Setaria sp.	4%				2%
small seeded legumes	8%				3%
INDETERMINATE	40%	33%	50%	39%	40%

Table 4.20. Frequency of species per site: Bronze Age Croatia

Phase	Site code	No. of samples	GRAIN	*Hordeum vulgare*	*Triticum dicoccum*	*Triticum monococcum*	*Triticum spelta*	*T. aestivum/durum*	"New glume wheat"	*Secale cereale*	*Avena sativa*	*Panicum miliaceum*	*Setaria italica*	CHAFF	*H. vulgare* rachis	*T. dicoccum* g/b	*T. monococcum* g/b	*T. mono/dicoc g/b*	*T. spelta* g/b	*T.aestivum/durum* rachis	"New glume wheat" g/b	PULSES	*Lathyrus sativus*	*Lens culinaris*	*Pisum sativum*	*Vicia ervilia*	OIL PLANTS	*Linum usitatissimum*
MN	VIRBRE	5				■																	■					
LN	IVAGAJ	14			■	■												■						■				
LN	CISMAV*	34		■	■	■											■	■			■							
LN	TURPEC*	22		■	■	■	■	■								■			■					■				
LN	SOPOT*	144		■	■	■	■	■		■					■	■	■	■	■		■		■	■	■	■		■
LN	RAVNOK*	57		■	■	■	■	■				■				■	■		■		■			■	■	■		
LN/CA	SLAVCA*	75		■	■	■		■					■		■	■	■	■	■	■	■			■				■
CA	SLAVCA*	22			■	■										■	■	■	■									
CA	PAJVEL	23		■																								
CA	POTOCA	1		■	■	■				■			■			■												
CA	JURSTV	12			■	■													■									
CA	TOMPAL	26		■	■	■		■								■	■											
CA	ĐAKFRA	29		■	■	■		■				■					■						■	■	■	■		■
CA	VIRBAT	3														■	■											
CA	VINMAG*	4		■	■	■	■	■		■		■																■
CA	VUCEDO	35		■	■	■	■	■					■				■			■								■
EBA	TOMPAL	28		■				■																				
LBA	MACCRI*	25			■						■	■	■											■				
LBA	CRIOST*	3										■																
LBA	ORUVES*	2										■																

Table 4.21. Presence/absence of crops per site: All 18 Croatian sites

Abbreviations: MN = Middle Neolithic; LN = Late Neolithic; CA = Copper Age; EBA= Early Bronze Age LBA = Late Bronze Age.

* Samples collected with flot mesh of 250 µm (Shaded boxes = species present at site)

Period	M/LN	CA	BA
No. sites	8	9	4
No .of samples	352	155	58
GRAIN			
Hordeum vulgare	10%	8%	2%
Triticum dicoccum	24%	16%	2%
Triticum monococcum	21%	28%	2%
T. monococcum 2-g	1%	1%	-
Triticum spelta	4%	3%	-
T. aestivum/durum	2%	3%	2%
Secale cereale	2%	1%	-
Avena sativa	-	-	9%
Panicum miliaceum	0.3%	1%	16%
Setaria italica	0.3%	2%	3%
CHAFF			
Hordeum vulgare rachis	1%	-	-
Triticum dicoccum g/b	12%	6%	-
Triticum monococcum g/b	9%	10%	-
Triticum spelta g/b	2%	1%	-
"New glume wheat" g/b	3%	-	-
T.aestivum/durum rachis	0.3%	1%	-
PULSES			
Lathyrus sativus	1%	1%	-
Lens culinaris	5%	1%	2%
Pisum sativum	3%	6%	-
Vicia ervilia	1%	-	-
OIL PLANTS			
Linum usitatissimum	3%	8%	-

Table 4.22. Frequency of each crop per period: All 18 Croatian sites

Total no. of samples	524
Total volume (litres)	5,240
Total no. of seed items (not inc. indet. frags)	329,535
Mean seed density per litre	63
Median seed density per litre	20
St. deviation	268

Table 5.1. Summary statistics: Late Bronze Age Feudvar

	Total no. of samples	Total volume sampled (l)	Grain	Chaff	Pulse	Oil plant	Fruit	Wild/weed	Feature type
Total no. of items	524	5240	104,448	144,578	8,195	817	1,717	69,780	Multiple
Mean			194	276	19	6	4	133	
Median			58	45	4	2	1	48	
St. deviation			744	1,924	143	21	40	512	

Table 5.2. Summary table of seed densities (per litre) of plant remains, grouped by plant category: Late Bronze Age Feudvar

Density	0-5	5.1-10	10.1-25	25.1+	Total no. of samples
No. samples	39	71	205	209	524
Feature type					
House floor deposits	18%	17%	32%	32%	115
Container fill	33%	22%	17%	28%	18
Pits	7%	7%	38%	49%	74
Yard	-	25%	50%	25%	12
Hearth	14%	10%	33%	43%	21
Street deposits	-	15%	31%	54%	13
General occupation level	1%	13%	46%	40%	257
Miscellaneous	7%	21%	36%	36%	14

Table 5.3. Percentage of samples from each feature type per density group: Late Bronze Age Feudvar

Unique sample no.	Sample volume (l)	Grain	Chaff	Pulse	Oil plant	Fruit	Wild/weed	Feature type	Dominant component
FEU487	10	27	78	0.4	0.6	0.4	17	General occupation layer	Chaff
FEU385	10	22	89	1	-	0.8	30	General occupation layer	Chaff
FEU441	10	20	83	0.2	0.5	0.4	48	General occupation layer	Chaff
FEU034	10	5	172	0.1	-	0.1	4	General occupation layer	Chaff
FEU084	10	26	171	0.3	-	0.1	11	House	Chaff
FEU057	10	51	152	0.2	-	-	47	General occupation layer	Chaff
FEU056	10	18	271	0.1	-	-	16	General occupation layer	Chaff
FEU425	10	80	277	1	-	0.2	26	General occupation layer	Chaff
FEU219	10	92	559	3	4	-	78	House	Chaff
FEU244	10	10	764	0.2	-	-	1	Pit	Chaff
FEU350	10	199	2,200	50	16	9	504	General occupation layer	Chaff
FEU217	10	646	3,595	5	18	-	313	House	Chaff
FEU128	10	776	659	-	-	0.1	9	Layer	Chaff/Grain
FEU079	10	4	3	280	-	-	13	Container fill	Pulse
FEU342	10	5	19	0.7	-	90	9	N-W house floor	Fruit
FEU220	10	79	10	5	-	-	6	Fish house floor	Grain
FEU205	10	92	6	1	-	0.3	23	House	Grain
FEU190	10	93	47	0.6	-	0.4	7	Pit - baker house	Grain
FEU209	10	192	1	-	-	-	9	Floor between hearth	Grain
FEU083	10	198	2	-	-	-	3	Next to hearth	Grain
FEU042	10	138	59	0.2	0.3	0.1	17	General occupation layer	Grain
FEU047	10	295	-	2	-	-	4	General occupation layer	Grain
FEU328	10	352	2	-	-	-	1	House	Grain
FEU092	10	252	163	-	-	-	3	House	Grain
FEU206	10	729	259	0.4	2	-	12	General occupation layer	Grain
FEU207	10	871	424	1	-	1	36	Fish house	Grain
FEU316	10	464	3	0.1	-	-	298	Yard	Grain
FEU013	10	57	46	0.3	-	0.1	4	Pit	Grain/Chaff
FEU403	10	60	39	0.2	0.8	0.2	11	General occupation layer	Grain/Chaff
FEU019	10	63	4	5	-	0.2	54	Pit	Grain/Weeds
FEU237	10	11	34	0.6	-	0.1	68	Pit	Weeds
FEU138	10	21	22	2	0.7	0.1	70	Pit	Weeds
FEU483	10	28	5	0.2	-	6	87	N-W house	Weeds
FEU408	10	20	45	2	1.5	0.1	61	General occupation layer	Weeds
FEU477	10	21	34	-	-	3	98	General occupation layer	Weeds
FEU396	10	8	2	0.2	-	2	161	General occupation layer	Weeds
FEU353	10	41	1	0.2	-	-	384	General occupation layer	Weeds
FEU485	10	159	7	0.4	0.1	0.3	927	North house	Weeds

Table 5.4. Density per litre of main plant categories, given for samples with a seed density of > 100 per litre: Late Bronze Age Feudvar

Period	LBA	
No of sites	1	
No. of samples	524	
GRAIN		
Hordeum vulgare		97%
Triticum dicoccum		73%
Triticum monococcum		99%
T. monococcum 2-g		1%
Triticum spelta		2%
T. aestivum/durum		9%
"New glume wheat"		-
cf. *Secale cereale*		63%
Avena sativa		-
Panicum miliaceum		31%
Setaria italica		-
CHAFF		
Hordeum vulgare rachis		22%
Triticum dicoccum g/b		61%
Triticum monococcum g/b		96%
Triticum spelta g/b		9%
"New glume wheat" g/b		-
T.aestivum/durum rachis		5%
PULSES		
Lathyrus sativus		4%
Lens culinaris		64%
Pisum sativum		22%
Vicia ervilia		40%
Vicia faba		1%
OIL PLANTS		
Linum usitatissimum		4%
Camelina sativa		20%

Table 5.5. Presence/absence of crops per site and taxa frequency (i.e. percentage of samples for each phase, with each crop): Late Bronze Age Feudvar (Abbreviations: LBA = Late Bronze Age, Shaded boxes = species present at site)

Period	M/LN	CA	BA
No. sites	8	9	5
No .of samples	352	155	582
GRAIN			
Hordeum vulgare	11%	8%	87%
Triticum dicoccum	24%	16%	66%
Triticum monococcum	21%	28%	90%
T. monococcum 2-g	1%	1%	1%
Triticum spelta	4%	3%	2%
T. aestivum/durum	2%	3%	8%
"New glume wheat"	-	-	-
Secale cereale	2%	1%	56%
Avena sativa	-	-	1%
Panicum miliaceum	0.3%	1%	30%
Setaria italica	0.3%	2%	0.3%
CHAFF			
Hordeum vulgare rachis	1%	-	19%
Triticum dicoccum g/b	12%	6%	66%
Triticum monococcum g/b	9%	10%	87%
Triticum spelta g/b	2%	1%	8%
"New glume wheat" g/b	3%	-	-
T.aestivum/durum rachis	0.3%	1%	4%
PULSES			
Lathyrus sativus	1%	1%	3%
Lens culinaris	5%	1%	57%
Pisum sativum	3%	6%	20%
Vicia ervilia	1%	-	36%
Vicia faba	-	-	1%
OIL PLANTS			
Linum usitatissimum	3%	8%	4%
Camelina sativa	-	-	18%

Table 5.6. Frequency of each crop per period: All 18 Croatian sites and LBA Feudvar

Stage	Ratio	Crop processing stage	
		High value	Low value
1	Cereal straw nodes: grains	By-product from early processing stage	Grain product
2	Glume wheat glume bases: grains	By-product from late processing stage	Grain product
3	Free threshing cereal rachis internodes: grains (barley, durum and bread wheat)	By-product from early processing stage	Grain product
4	Weed seeds: cereal grains	By-product from late processing stage	Grain product
5	Small: large weed seeds	By-product from sieving	Product from sieving or by-product of hand cleaning
6	Number of crop items per litre of deposit	Rapid/single deposition (usually result of accident)	Slow/repeated deposition (usually day-to-day activity)

Table 6.1. The grain, chaff and weed ratios used to identify crop processing stages and their interpretation. After Van der Veen 1992: chapter 7 and Van der Veen and Jones 2006: 223, Table 2. The 'high' and 'low' value for ratios 1-3 refers to the degree to which they differ from the complete cereal plant. Ratios 4-6 refer to the relative value compared to other samples within the site/region/period.

Species	Length	Width	Jones (1984)	Van der Veen (1992)	Peña-Chocarro (1999)	Bogaard (2002)	Group A >3mm <2.5mm)	Group B >2.5mm <2mm)
Adonis sp.	4.13	2.96					BFH	BFH
Agrimonia eupatoria	3.87	2.09				BHH	BHH	BHH
Agrimonia odorata	3.93	2.57					BHH	BHH
Agrimonia sp.	3.9	2.33					BHH	BHH
Agrostemma githago	4.21	3.14		BFH	BFH	BFH	BFH	BFH
Ajuga chamaepitys	3.95	1.54					BFH	BFH
Allium sp.	3.27	2.01					BHH	BHH
Althaea officinalis	3.98	3.5					BFH	BFH
Anagallis arvensis	1.29	1.02					SHH	SHH
Anethum sp.	4.14	2.21					BFH	BFH
Anthemis tinctoria	2.29	1.1					SFH	SFH
Anthemis sp.	2.07	1.01			SHH		SFH	SFH
Aphanes sp.	1.01	0.71					SFH	SFH
Asperula arvensis	2.34	2.28			BFH		SFH	IBT
Atriplex hastate	2.27	1.77		SFH		SFH	SFH	SFH
Atriplex patula	2.18	2.03		SFH		SFH	SFH	IBT
Avena fatua	7.9	2.24		BFH			BFH	BFH
Avena sp.	8.25	2.37		BFH	BHH		BFH	BFH
cf. *Barbarea* sp.	1.9	1.29					SHH	SHH
Berteroa sp.	1.94	1.47					SHH	SHH
Bromus arvensis	5.78	0.98				BFH	BFH	BFH
Bromus mollis type	6.88	2.26		BFH		BFH	BFH	BFH
Bromus secalinus	6.61	2.15		BFH		BFH	BFH	BFH
Bromus sp.	5.58	1.68					BFH	BFH
Bupleurum rotundifolium	3.51	1.51					BHH	BHH
Carduus sp.	4.21	1.78					BFH	BFH
Carex vulpina	1.88	1.33					SFH	SFH
Carex subsp. *Eucarex*	3.75	1.59					BFH	BFH
Carex subsp. *Vignea*	2.15	1.12					SFH	IBT
Carthamus lanatus	6.98	4.43					BFH	BFH
Centaurea sp.	3.89	1.78					BFH	BFH
Cerastium sp.	0.69	1.33			SFH		SFH	SFH
Chenopodium album	1.69	1.54		SFH		SFH	SFH	SFH
Chenopodium glaucum/rubrum	0.9	0.82				SFH	SFH	SFH
Chenopodium hybridum	1.89	1.73				BFH	SFH	SFH
Chenopodium polyspermum	1.16	1.07				SFH	SFH	SFH
Chenopodium sp.	1.41	1.29		SFH	SFH	SFH	SFH	SFH
Cichorium intybus	3.8	1	SHH				BHH	BHH
Conringia sp.	2.96	1.56					IBT	BHH

Table 6.2. Classification of wild/weed taxa into physical weed categories per author, (BFH= big free heavy, BHH = big headed heavy, SFH = small free heavy, SFL = small free light, SHH = small headed heavy, SHL = small headed light)

Species	Length	Width	Jones (1984)	Van der Veen (1992)	Peña-Chocarro (1999)	Bogaard (2002)	Group A >3mm <2.5mm)	Group B >2.5mm <2mm)
Conringia orientalis	2.96	1.56					IBT	BHH
Consolida sp.	2.3	1.69			SFH		SFH	IBT
Convolvulus arvensis	4.17	3.09					BHH	BHH
Coronilla sp.	3.9	0.9			SHH		BHH	BHH
Cyperus sp.	1.24	0.58					SFH	SFH
Daucus sp.	4.4	2.83			BFH		BFH	BFH
Dianthus sp.	1.81	1.26					SFL	SFL
Digitaria sp.	1.74	0.82					SFH	SFH
Echinochloa crus-galli	1.66	1.39				SFH	SFH	SFH
Echium sp.	2.98	1.8					SFH	SFH
Euphorbia helioscopia	2.35	1.77					SFH	IBT
Euphorbia sp.	2.34	1.64			SFH		SFH	IBT
Euphorbia palustris	3.25	3.03					BFH	BFH
Galeopsis sp.	2.95	2.16		BFH			IBT	BFH
Galium aparine	4.13	3.75	BFH	BFH		BFH	BFH	BFH
Galium spurium	2.62	2.33				SFH	IBT	BFH
Galium sp.	2.05	1.77			SFH		SFH	SFH
Geranium sp.	2.56	1.53			SFH		IBT	BFH
Glaucium corniculatum	0.81	0.74					SHH	SHH
Hyoscyamus niger	1.61	1.31		SFH		SFH	SFH	SFH
Hypericum sp.	0.9	0.37					SFL	SFL
Juncus sp.	0.57	0.29					SFL	SFL
Kickxia cf. *spuria*	1.37	0.78					SHH	SHH
Knautia sp.	4.8	2					BFH	BFH
Lactuca sp.	4.26	1.27					BFH	BFH
Lallemantia iberica	4	1.5					BFH	BFH
Lapsana communis	4.06	1.09					BFH	BFH
Luzula sp.	1.75	1.01					SFH	SFH
Legousia sp.	1.35	0.81					SFH	SFH
Leontodon cf. *hispidus*	6.01	0.83					BFH	BFH
Lithospermum arvense	2.92	2.05	SFH				IBT	BFH
Lithospermum officinale	3.27	2.49					BFH	BFH
Lolium cf. remotum	3.96	1.34					BFH	BFH
Lolium temulentum	5.03	2.29	BFH				BFH	BFH
Lolium sp.	4.36	1.63			BFH		BFH	BFH
Malva sylvestris	1.95	1.78	SHH			SHH	SHH	SHH
Malva sp.	2.43	2.18				SHH	BHH	IBT
Mentha sp.	0.77	0.6					SFL	SFL
Neslia paniculata	2.95	2.49					IBT	BFH
Onopordum acanthium	5.81	3.2					BFH	BFH
Papaver dubium	0.8	0.62				SHL	SHL	SHL
Papaver somniferum	0.89	0.68					SHL	SHL

Table 6.2. (Continued)

Species	Length	Width	Jones (1984)	Van der Veen (1992)	Peña-Chocarro (1999)	Bogaard (2002)	Group A >3mm <2.5mm)	Group B >2.5mm <2mm)
Pastinaca sativa	5.49	4.66				BFH	BFH	BFH
Petrorhagia saxifraga	1.38	0.91					SFL	SFL
Phragmites australis	1.46	0.51					SFH	SFH
Picris hieracioides	4.34	1.13				SFH	BFH	BFH
Plantago lanceolata	3.01	1.42		SFH		SHH	BFH	BFH
Plantago sp.	2.13	1.04			SHL		SFH	IBT
Polygonum aviculare	3	1.79		SFH		BFH	BFH	BFH
Polygonum convolvulus	3.64	2.69		BFH		BFH	BFH	BFH
Polygonum hydropiperoide	2.5	2					SFH	BFH
Polygonum lapathifolium	3.15	2.54		SFH		BFH	BFH	BFH
Polygonum persicaria	2.91	1.98		SFH		BFH	IBT	BFH
Portulaca oleracea	1.33	1.16					SHH	SHH
Potamogeton sp.	3.12	2.15					BFH	BFH
Ranunculus acris type	3.56	2.32					BFH	BFH
Rorippa type	0.89	0.68					SHL	SHL
Rumex crispus type	2.5	1.63				SFH	SFH	BFH
Rumex sp.	2.48	1.4		SFH	SFH	SFH	SFH	IBT
Schoenoplectus lacustris	3.2	2.17					BFH	BFH
Scirpus sp.	1.65	1.12					SFH	SFH
Scleranthus annuus	2.14	1.07					SHH	IBT
Scrophularia sp.	1.03	0.68					SHH	SHH
Setaria viridis	1.63	1.07				SFH	SFH	SFH
Sherardia arvensis	2.84	1.37	SFH				IBT	BFH
Silene sp.	1.15	0.97				SHH	SHH	SHH
Sisymbrium officinale	1.4	0.83				SFH	SFH	SFH
Solanum nigrum	2.24	1.5				SFH	SFH	IBT
Spergula sp.	1.59	1.47					SFH	SFH
Stachys annua	1.95	1.56					SFH	SFH
Stellaria media	1.27	1.17		SFH			SFH	SFH
Teucrium sp.	1.64	1.24			SFH		SFH	SFH
Thymelaea passerina	1.79	1					SFH	SFH
Trifolium sp.	1.67	1.21			SHH	SFH	SFH	SFH
Torilis arvensis	4.67	3.16					BFH	BFH
Urtica dioica	1.27	0.91				SFH	SFH	SFH
Valerianella dentata	2.99	1.5				SFH	IBT	BFH
Verbascum sp.	1.04	0.67			SFH	SFL	SFL	SFL
Verbena officinalis	1.82	0.66				SFH	SFH	SFH
Veronica sp.	1.29	0.94					SFL	SFL
Vicia sp.	3.52	3.06				BFH	BFH	BFH

Table 6.2. (Continued)

Cereal	Avg. length (mm)	Avg. width (mm)
Hordeum vulgare	8.00	3.37
Triticum aestivum/durum	7.00-9.00	3.50
Triticum dicoccum	7.50	2.50
Triticum monococcum	7.50	2.75
Triticum spelta	8.56	2.84
Secale cereale	8.95	3.48
Avena sativa	8.95	2.92
Panicum miliaceum	2.29	2.19

Table 6.3. The average length and width (mm) of grain per cereal species. Measurements from Cappers *et al.* 2006

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Ratio stage	*Species*	*Ratio*	*Value*	*Low value*	*High value*
2	Einkorn glume base: grain	2:1	2	< 0.4	> 2.2
2	Emmer glume base: grain	2:2	1	< 0.6	> 1.5
2	Spelt glume base: grain	2:2	1	< 0.6	> 1.5
3	Bread/durum wheat rachis: grain	1:2-6	0.2-0.6	< 0.1	> 1
3	Barley rachis: grain	1:3	0.3	< 0.2	> 1
3	Rye rachis: grain	1:3	0.3	< 0.2	> 1
2	Broomcorn millet spikelet: grain	1:1	1	< 0.6	> 1.5
4	Weed: grain		1	< 0.8	> 1.2
5	Small: large weed		1	< 0.8	> 1.2

Table 6.4. Ratio table for crop processing analysis, showing the whole plant ratio per cereal, the grain, chaff and weed ratio values and what constitutes a low and high value.

	Spikelets – sieved	Spikelets- unsieved	Fine sieving by-product- sieved	Fine sieving by-product- unsieved	Product - sieved	Product - unsieved	Total
Einkorn	21 (64)	22 (32)	79	87 (3)	103 (4)	26 (4)	445
Einkorn/Emmer	-	-	1	-	-	-	1
Einkorn/Barley	-	-	-	-	3 (5)	-	8
Einkorn/Barley/ Bread/ durum wheat	-	-	(2)	-	-	-	2
Emmer	-	-	3	-	2	-	5
Barley	-	-	-	-	12	2	14
Barley/broomcorn millet	-	-	-	-	1	-	1
Broomcorn millet	-	-	-	-	2 (1)	(3)	6
Rye	-	-	-	-	1	1	2
Total	85	54	85	90	134	36	484

Table 6.6. Summary of the number of samples identified for each crop processing stage, based on the ratio analysis. ( ) = tentative identifications: Late Bronze Age Feudvar

Species	Code	Species	Code
Agrostemma githago	AGROGIT	*Panicum miliaceum*	PANIMIL
Ajuga chamaepitys	AJUGCHA	*Plantago lanceolata*	PLANLAN
Allium sp.	ALLISPE	Polygonaceae	POLYGON
Atriplex patula type	ATRIPAT	*Polygonum aviculare*	POLYAVI
Bromus arvensis	BROMARV	*Polygonum convolvulus*	POLYCON
Bromus sp.	BROMSPE	*Polygonum persicaria* t	POLYPER
Bupleurum rotundifolium	BUPLROT	*Portulaca oleracea*	PORTOLE
Caryophyllaceae	CARYOPH	*Rumex crispus* type	RUMECRI
cf. *Secale cereale*	SECACEG	*Schoenoplectus lacustris*	SCHOLAC
Chenopodium hybridum	CHENHYB	*Setaria viridis*	SETAVIR
Chenopodium sp.	CHENSPE	*Sherardia arvensis*	SHERARV
Conringia orientalis	CONRORI	*Silene* sp.	SILESPE
Cruciferae	CRUCIFE	*Solanum nigrum*	SOLANIG
Cyperaceae	CYPERAC	*T. aestivum/durum*	TRITAED
Digitaria sp.	DIGISPE	*Teucrium* sp.	TEUCSPE
Echinochloa crus-galli	ECHICRG	*Thymelaea passerina*	THYMPAS
Euphorbia palustris	EUPHPAL	*Trifolium* sp.	TRIFSPE
Galium spurium	GALISPU	*Triticum dicoccum*	TRITDIC
Glaucium corniculatum	GLAUCOR	*Triticum dic* g/b	TRITDIG
Gramineae	GRAMINE	*Triticum monococcum*	TRITMOT
Hordeum vulgare	HORDSAS	*Triticum mon* g/b	TRITMOG
Hordeum vulgare rachis	HORDSRS	*Triticum spelta*	TRITSPL
Hyoscyamus niger	HYOSNIG	*Triticum spelta* g/b	TRISPLG
Labiatae	LABIATA	*Verbena officinalis*	VERBOFF
Lolium sp.	LOLISPE	*Vicia* sp.	VICISPE
Malva sp.	MALVSPE		

Table 6.7. Species codes used in the correspondence analysis of the archaeobotanical data: Late Bronze Age Feudvar

		Einkorn	Einkorn/Emmer	Einkorn/Barley	Einkorn/Barley/ Bread/durum	Emmer	Barley	Barley/Broomcorn millet	Broomcorn millet	Rye	Total	
											Ratio	CA
Spikelets - sieved	Ratio	21 (64)	-	-	-	-	-	-	-	-	85	
	CA	82	-	-	-	-	-	-	-	-		82
Spikelets- unsieved	Ratio	22 (32)	-	-	-	-	-	-	-	-	54	
	CA	57	-	-	-	-	-	-	-	-		57
Fine sieving by-product- sieved	Ratio	79	1	-	(2)	3	-	-	-	-	85	
	CA	79	1	-	2	3	-	-	-	-		85
Fine sieving by-product- unsieved	Ratio	87 (3)	-	-	-	-	-	-	-	-	90	
	CA	90	-	-	-	-	-	-	-	-		90
Product - sieved	Ratio	103 (4)	-	3 (5)	-	2	12	1	2 (1)	1	134	
	CA	107	-	8	-	2	12	1	3	1		134
Product - unsieved	Ratio	26 (4)	-	-	-	-	2	-	(3)	1	36	
	CA	30	-	-	-	-	2	-	3	1		36
Total	Ratio	445	1	8	2	5	14	1	6	2	484	
	CA	445	1	8	2	5	14	1	6	2		484

Table 6.8. Summary of the number of samples identified for each crop processing stage from the ratio analysis and after correspondence analysis. ( ) = tentative identifications: Late Bronze Age Feudvar

Chenopodium sp. content	USP	UFS	UP
> 90%		FEU135 FEU165	
> 70%	FEU023 FEU136 FEU208 FEU233 FEU468	FEU005 FEU006 FEU041 FEU053 FEU070 FEU094 FEU182 FEU279 FEU395	FEU396 FEU461

Table 6.9. Samples with > 90% and >70% *Chenopodium* sp. content per identified crop processing group. USP= Unsieved spikelets, UFS = Unsieved fine sieving by-products, UP= Unsieved products

Feature type	Spikelets	Fine sieving by-products	Products	Total no. of samples
Container fill	27%	64%	9%	11
General occupation layer	29%	38%	33%	253
Hearth	22%	50%	28%	18
House	33%	33%	34%	94
Miscellaneous	15%	46%	38%	13
Pit	27%	33%	40%	70
Street	15%	15%	69%	13
Yard	33%	8%	58%	12
Total no. of samples	139	175	170	484

Table 6.10. Percentage of samples per feature type based on their crop processing identifications: LBA Feudvar

Block	Container fill	General occupation layer	Hearth	House	Pit	Street	Yard	Total no. of samples
1	-	55%	-	35%	10%	-	-	20
2	-	39%	-	33%	28%	-	-	18
3	3%	59%	13%	15%	10%	-	-	39
4	-	43%	9%	18%	25%	5%	-	44
5	10%	65%	2%	18%	5%	2%	-	62
6	-	43%	10%	30%	7%	10%	-	60
7	-	56%	-	34%	3%	6%	-	32
8	3%	69%	-	19%	9%	-	-	32
9	-	64%	-	4%	20%	-	12%	25
10	-	60%	-	10%	10%	-	20%	20
11	-	33%	-	13%	33%	7%	13%	15
12	-	70%	-	-	20%	-	10%	20
13	11%	32%	-	21%	32%	5%	-	19
14	-	64%	-	18%	18%	-	-	33
15	-	29%	29%	29%	14%	-	-	7
16	14%	73%	-	9%	9%	-	-	11

Table 6.11. Percentage of samples per block in relation to feature type: LBA Feudvar

	Container fill	General occupation layer	Hearth	House	Miscellaneous	Pit	Street	Yard	Total no. of samples
Einkorn	10	241	14	82	12	62	13	11	445
Emmer	-	1	1	1	-	1	-	1	5
Barley	-	4	3	6	-	1	-	-	14
Broomcorn millet and Rye	-	2	-	1	1	4	-	-	8
Mix	1	5	-	4	-	2	-	-	12
Total no. of samples	11	253	18	94	13	70	13	12	484

Table 6.12. The number of samples identified to each cereal per feature type: LBA Feudvar

	Container fill	General occupation layer	Hearth	House	Pit	Street	Yard	Total no. of items
Barley grain	1%	52%	4%	30%	9%	2%	1%	15102
Barley rachis	-	45%	-	50%	3%	1%	-	1232
Einkorn grain	1%	35%	1%	40%	6%	3%	1%	73491
Einkorn glume base	1%	39%	1%	39%	11%	1%	-	135994
Emmer grain	1%	26%	48%	11%	10%	1%	2%	4208
Emmer glume base	1%	51%	1%	33%	9%	1%	1%	6602
Bread/durum grain	-	89%	-	2%	2%	-	-	471
cf. Rye	1%	42%	-	45%	4%	1%	1%	3264
Broomcorn millet	-	23%	1%	3%	63%	-	1%	2660
Weeds	1%	50%	2%	30%	12%	1%	1%	62220

Table 6.13. Percentage of each cereal per feature type: LBA Feudvar

House	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Barley grain	2%	2%	4%	10%	4%	2%	7%	16%	5%	-	-	-	6%	23%	-	-
Barley rachis	-	-	-	-	-	-	-	-	1%	-	-	-	-	-	-	-
Einkorn grain	26%	19%	19%	23%	26%	55%	30%	25%	14%	-	-	-	24%	8%	-	-
Einkorn glume base	27%	40%	17%	32%	47%	38%	26%	23%	21%	-	-	-	41%	13%	-	-
Emmer grain	1%	2%	1%	1%	2%	-	1%	-	5%	-	-	-	6%	-	-	-
Emmer glume base	1%	3%	1%	3%	1%	-	-	1%	-	-	-	-	9%	-	-	-
Broomcorn millet grain	-	1%	1%	-	2%	1%	-	-	-	-	-	-	-	1%	-	-
cf. Rye grain	1%	1%	3%	1%	1%	-	-	1%	12%	-	-	-	-	-	-	-
Weeds	41%	32%	54%	30%	16%	4%	36%	34%	43%	-	-	-	15%	55%	-	-
Total no. of seeds	866	530	720	412	438	5,058	1,069	398	161	-	-	-	93	167	-	-
Pit																
Barley grain	7%	4%	2%	2%	-	3%	7%	3%	4%	-	-	31%	12%	4%	-	-
Barley rachis	1%	1%	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Einkorn grain	24%	14%	8%	23%	-	53%	33%	26%	20%	-	-	19%	17%	8%	-	-
Einkorn glume base	29%	21%	16%	31%	-	35%	24%	37%	19%	-	-	38%	23%	8%	-	-
Emmer grain	11%	3%	1%	1%	-	2%	1%	3%	15%	-	-	2%	-	-	-	-
Emmer glume base	4%	10%	1%	4%	-	-	-	8%	14%	-	-	-	-	-	-	-
Broomcorn millet grain	1%	1%	4%	-	-	-	12%	-	-	-	-	2%	4%	2%	-	-
cf. Rye grain	2%	2%	-	-	-	-	4%	1%	-	-	-	-	-	1%	-	-
Weeds	23%	45%	67%	39%	-	6%	18%	22%	27%	-	-	9%	44%	76%	-	-
Total no. of seeds	497	135	1,789	647	-	1,657	304	174	250	-	-	173	464	190	-	-

Table 6.14. Percentage of each cereal per block for house and pit features from samples identified as spikelets: LBA Feudvar

House	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Barley grain	-	4%	3%	6%	2%	7%	1%	1%	-	-	4%	-	4%	16%	5%	2%
Barley rachis	-	-	1%	-	-	-	1%	-	-	-	1%	-	-	-	-	-
Einkorn grain	3%	14%	8%	13%	21%	13%	13%	6%	-	-	13%	-	10%	12%	7%	4%
Einkorn glume base	8%	54%	56%	35%	61%	62%	78%	2%	-	-	63%	-	31%	2%	50%	-
Emmer grain	1%	1%	4%	1%	1%	1%	0%	6%	-	-	0%	-	1%	3%	1%	-
Emmer glume base	1%	1%	1%	7%	1%	2%	0%	77%	-	-	2%	-	-	-	26%	-
Broomcorn millet grain	-	-	-	-	-	-	-	-	-	-	2%	-	-	-	-	-
cf. Rye grain	-	1%	-	1%	-	-	1%	-	-	-	3%	-	1%	-	2%	-
Weeds	87%	24%	28%	38%	14%	15%	6%	8%	-	-	12%	-	53%	67%	9%	95%
Total no. of seeds	774	1,050	335	204	649	1,743	52,720	2,192	-	-	231	-	236	89	853	55
Pit	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**
Barley grain	-	-	1%	3%	-	1%	-	13%	0%	5%	1%	11%	2%	6%	15%	-
Barley rachis	-	1%	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Einkorn grain	-	7%	2%	11%	-	4%	-	12%	1%	13%	13%	8%	5%	12%	14%	-
Einkorn glume base	-	82%	23%	29%	-	88%	-	51%	95%	36%	71%	39%	16%	45%	49%	-
Emmer grain	-	1%	1%	1%	-	1%	-	0%	1%	0%	0%	1%	3%	1%	2%	-
Emmer glume base	-	1%	2%	1%	-	1%	-	3%	0%	1%	1%	2%	18%		3%	-
Broomcorn millet grain	-	1%		1%	-		-	1%	-	-	-	-	-	2%	-	-
cf. Rye grain	-			1%	-		-	2%	-	1%	1%	-	2%	-	1%	-
Weeds	-	8%	69%	53%	-	5%	-	19%	2%	44%	14%	39%	54%	34%	16%	-
Total no. of seeds	-	1,659	207	439	-	520	-	75	8,907	318	260	2,049	1,242	194	152	-

Table 6.15. Percentage of each cereal per block for house and pit features from samples identified as fine sieving by-products: LBA Feudvar

House	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Barley grain	-	-	11%	5%	5%	16%	2%	19%	-	16%	5%	-	2%	54%	-	-
Barley rachis	-	-	-	-	-	-	-	-	-	1%	-	-	-	-	-	-
Einkorn grain	-	-	18%	62%	38%	43%	87%	28%	-	34%	32%	-	26%	6%	-	-
Einkorn glume base	-	-		29%	6%	11%	2%	17%	-	11%	5%	-	8%	9%	-	-
Emmer grain	-	-	-	1%	-	2%	-	1%	-	6%	6%	-	-	-	-	-
Emmer glume base	-	-	-	-	-	2%	-	2%	-	6%	-	-	-	-	-	-
Broomcorn millet grain	-	-	-	-	-	1%	-	0%	-	1%	-	-	-	-	-	-
cf. Rye grain	-	-	3%	-	13%	1%	1%	0%	-	2%	3%	-	-	-	-	-
Weeds	-	-	68%	3%	37%	24%	8%	33%	-	24%	50%	-	64%	30%	-	-
Total no. of seeds	-	-	12,213	15,828	3,198	1,163	4,438	1,023	-	142	101	-	154	806	-	-
Pit	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**
Barley grain	1%	7%	-	16%	6%	11%	-	18%	12%	5%	17%	-	-	2%	-	7%
Barley rachis	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Einkorn grain	61%	6%	-	30%	46%	62%	-	39%	41%	22%	18%	-	-	6%	-	28%
Einkorn glume base	16%	19%	-	11%	15%	13%	-	7%	1%	12%	7%	-	-	20%	-	18%
Emmer grain	2%	1%	-	1%	1%	3%	-	2%	8%	1%	3%	-	-	1%	-	2%
Emmer glume base	-	2%	-	3%	-	-	-	11%	3%	15%	1%	-	-	2%	-	3%
Broomcorn millet grain	1%	32%	-	1%	-	-	-	2%	1%	1%	13%	-	-	45%	-	8%
cf. Rye grain	1%	-	-	1%	1%	-	-	2%	2%	2%	1%	-	-	-	-	2%
Weeds	17%	33%	-	37%	31%	11%	-	20%	32%	41%	40%	-	-	25%	-	32%
Total no. of seeds	352	506	-	1,620	878	238	-	106	125	146	1,490	-	-	2,437	-	77

Table 6.16. Percentage of each cereal per block for house and pit features from samples identified as products: LBA Feudvar

Crop processing groups	Original no. of species present	No. of species in >10% of samples	Total no. of samples	No. of samples with >25 weed seeds
Spikelets - sieved	84	16 (19%)	83	51 (61%)
Spikelets - unsieved	89	27 (30%)	56	54 (96%)
Fine sieving by-product- sieved	89	16 (18%)	85	59 (69%)
Fine sieving by-product- unsieved	94	22 (23%)	90	83 (92%)
Products - sieved	96	18 (19%)	134	86 (64%)
Products - unsieved	80	30 (38%)	36	35 (97%)

Table 7.1. The number of species present in >10% of each of the six crop processing groups and the number of samples with >25 weed seeds: LBA Feudvar

Spikelets - unsieved	Fine sieving by-products - unsieved	Products - unsieved
FEU023	FEU005	FEU396
FEU136	FEU006	FEU461
FEU208	FEU041	
FEU233	FEU053	
FEU468	FEU070	
	FEU094	
	FEU135	
	FEU165	
	FEU182	
	FEU279	
	FEU395	

Table 7.2. Samples with >70% *Chenopodium* sp. content within the unsieved spikelets, fine sieving by-product and product groups: LBA Feudvar

Taxa	Taxa code	Light (L)		Temperature (T)		Continentality (K)		Moisture (F)		Reaction (R)		Nitrogen (N)	
		BOR95	ELL79	BOR95	ELL79	BOR95	ELL79	BOR95	ELL79	BOR95	ELL79	BOR95	ELL79
Agrostemma githago	AGROGIT	7	7	6	x	5	x	5	x	6	x	5	x
Ajuga chamaepitys	AJUGCHA	8	7	8	8	2	2	3	4	8	9	2	2
Allium sp.	ALLISPE	*7*	*7*	*7*	*5*	*5*	*5*	*4*	*4*	*7*	*7*	*4*	*4*
Atriplex patula	ATRIPAT	7	6	5	6	4	x	5	5	7	7	4	7
Bromus arvensis	BROMARV	7	6	6	x	4	4	4	4	8	8	5	4
Bromus sp.	BROMSPE	*7*	*6*	*6*	*6*	*3*	*3*	*4*	*x*	*7*	*6*	*5*	*x*
Bupleurum rotundifolium	BUPLROT	8	8	7	7	4	4	3	3	8	9	4	4
Chenopodium hybridum	CHENHYB	7	7	6	6	7	7	6	5	8	8	8	8
Chenopodium sp.	CHENSPE	*7*	*8*	*6*	*6*	*7*	*7*	*6*	*6*	*8*	*x*	*8*	*8*
Conringia orientalis	CONRORI	7	7	6	6	5	5	3	3	9	9	4	4
Digitaria sp.	DGISPE	*7*	*7*	*7*	*7*	*4*	*4*	*4*	*4*	*5*	*4*	*4*	*4*
Echinochloa crus-galli	ECHICRG	8	6	7	7	5	5	7	5	7	x	8	8
Euphorbia palustris	EUPHPAL	8	8	6	6	6	6	9	8	8	8	5	x
Galium spurium	GALISPU	7	7	6	x	5	5	5	5	7	8	*5*	5
Glaucium corniculatum	GLAUCOR	9	7	8	7	6	6	4	4	8	9	4	4
Hyoscyamus niger	HYOSNIG	8	8	6	6	4	x	4	4	7	7	9	9
Lolium sp.	LOLISPE	*7*	*7*	*7*	*7*	*4*	*4*	*4*	*5*	*8*	*6*	*4*	*x*
Malva sp.	MALVSPE	*8*	*8*	*7*	*6*	*5*	*5*	*4*	*4*	*7*	*7*	*8*	*7*
Plantago lanceolata	PLANLAN	7	6	5	x	3	3	4	x	6	x	5	x
Polygonum aviculare	POLYAVI	9	7	5	x	3	x	4	x	6	x	5	x
Polygonum convolvulus	POLYCON	7	7	5	x	3	x	5	x	5	x	3	x
Polygonum persicaria	POLYPER	6	6	5	5	3	3	7	3	6	x	7	7
Portulaca oleracea	PORTOLE	7	7	8	8	3	3	4	4	7	7	7	7
Rumex crispus type	RUMECRI	7	7	5	5	3	3	6	7	6	x	7	6
Setaria viridis	SETAVIR	7	7	6	6	5	x	4	4	7	x	7	7
Sherardia arvensis	SHERARV	6	6	6	6	3	3	5	5	8	8	5	5
Silene sp.	SILESPE	*8*	*8*	*7*	*5*	*5*	*4*	*3*	*4*	*7*	*7*	*3*	*3*
Solanum nigrum	SOLANIG	7	7	6	6	3	3	6	5	7	7	8	8
Teucrium sp.	TEUCSPE	*8*	*7*	*6*	*6*	*4*	*4*	*4*	*3*	*8*	*7*	*2*	*2*
Thymelaea passerina	THYMPAS	8	7	7	7	6	6	4	4	8	8	4	4
Trifolium sp.	TRIFSPE	*8*	*7*	*6*	*5*	*5*	*4*	*4*	*4*	*7*	*6*	*3*	*3*
Verbena officinalis	VERBOFF	9	9	6	6	3	3	4	5	8	7	6	7
Vicia sp.	VICISPE	*7*	*7*	*6*	*6*	*5*	*4*	*4*	*4*	*6*	*6*	*4*	*4*

Table 7.3. Ecological indicator values per species and genus. After Borhidi 1995 (BOR95) and Ellenberg 1979 (ELL79). italics i.e. *6* = uncertain, X = indifferent

Taxa	Taxa code	Height (cm)	Annual (A)/ Biennial (B)/ Perennial (P)	Summer (S)/ Winter (W) annuals
Agrostemma githago	AGROGIT	30-100	A	W
Ajuga chamaepitys	AJUGCHA	10-40	A, B	S
Allium sp.	ALLISPE	20-100	P	
Atriplex patula type	ATRIPAT	30-150	A	S
Bromus arvensis	BROMARV	30-100	A, B	W
Bromus sp.	BROMSPE	30-120	A, B	W
Bupleurum rotundifolium	BUPLROT	10-60	A	W
Chenopodium hybridum	CHENHYB	30-100	A	S
Chenopodium sp.	CHENSPE	30-150	A	S
Conringia orientalis	CONRORI	10-60	A	W
Digitaria sp.	DGISPE	10-60	A	S
Echinochloa crus-galli	ECHICRG	30-100	A	S
Euphorbia palustris	EUPHPAL	50-150	P	
Galium spurium	GALISPU	40-150	A	S/W
Glaucium corniculatum	GLAUCOR	30-40	A, B	S
Hyoscyamus niger	HYOSNIG	20-100	A, B	S
Lolium sp.	LOLISPE	30-120	A	S
Malva sp.	MALVSPE	30-200	P	
Plantago lanceolata	PLANLAN	10-50	P (with rhizome)	
Polygonum aviculare	POLYAVI	10-50	A	S
Polygonum convolvulus	POLYCON	>100	A	S
Polygonum persicaria	POLYPER	20-60	A	S
Portulaca oleracea	PORTOLE	<50	A	S
Rumex crispus type	RUMECRI	30-150	P	
Setaria viridis	SETAVIR	10-100	A	S
Sherardia arvensis	SHERARV	>40	A	W
Silene sp.	SILESPE	5-100	A, B, P	
Solanum nigrum	SOLANIG	10-70	A	S
Teucrium sp.	TEUCSPE	10-60	A, P	
Thymelaea passerina	THYMPAS	10-40	A	?
Trifolium sp.	TRIFSPE	5-60	A, P	
Verbena officinalis	VERBOFF	30-60	P	
Vicia sp.	VICISPE	20-120	A, B, P	

Table 7.4. The height, life cycle and germination times of each species: LBA Feudvar. After Bojnanský and Fargaová 2007; Ellenberg *et al.* 1991; Häfliger and Brun-Hool 1968–1977.

Phytosociological Class	Species
Chenopodietea	*Atriplex patula*
	Bromus arvensis
	Chenopodium hybridum
	Digitaria sp. (various)
	Echinochloa crus-galli
	Hyoscyamus niger
	Polygonum aviculare
	Polygonum persicaria
	Portulaca oleracea
	Setaria viridis
	Solanum nigrum
	Verbena officinalis
Secalinetea	*Agrostemma githago*
	Ajuga chamaepitys
	Bupleurum rotundifolium
	Conringia orientalis
	Galium spurium
	Glaucium corniculatum
	Sherardia arvensis
	Thymelaea passerine
Molinio-Arrhenatheretea	*Plantago lanceolata*
Plantaginetea	*Rumex crispus*

Table 7.5. Character species identified within Feudvar assemblage under the Phytosociological Classes. After Ellenberg 1979

	Romania	Hungary	Bosnia Herzegovina	Croatia	Serbia	Total no. of records
Mid/Late Neolithic	3	49	10	1	7	70
Copper Age	1	26	-	2	1	30
Bronze Age	8	55	-	2	4	69
Total no. of records	12	130	10	5	12	168

Table 8.2. Number of records per country and period: Carpathian Basin

	Mid/Late Neolithic	Copper Age	Bronze Age	Total no. of records
No. of records with species presence/absence only	20	2	10	19%
No. of records with presence/absence and the overall no. of remains per site	46	27	57	77%
No. of records with full sample details	4	1	2	4%
Total no. of records	70	30	69	169

Table 8.3. The level of information available for each record per period: Carpathian Basin

	Romania (n=12)	Hungary (n=130)	Bosnia Herzegovina (n=10)	Croatia (n=5)	Serbia (n=12)	Total no. of crops (n=169)
Mid/Late Neolithic	13	15	10	4	9	16
Copper Age	6	10	-	1	8	10
Bronze Age	11	16	-	8	13	16

Table 8.4. Number of crops identified per country and period: Carpathian Basin (n= total no. of records per country)

	Romania (n=12)	Hungary (n=130)	Bosnia Herzegovina (n=10)	Croatia (n=5)	Serbia (n=12)	Total no. of crops (n=169)
Mid/Late Neolithic	10	10	10	2	12	20
Copper Age	2	4	-	1	2	6
Bronze Age	2	8	-	3	12	15

Table 8.5. Number of fruits/nuts identified per country and period: Carpathian Basin (n= total no. of records per country)

	Romania (n=12)	Hungary (n=130)	Bosnia Herzegovina (n=10)	Croatia (n=5)	Serbia (n=12)	Total no. of crops (n=169)
Mid/Late Neolithic	41	110	34	2	23	188
Copper Age	-	24	-	8	22	44
Bronze Age	11	149	-	4	30	155

Table 8.6. Number of wild/weed species identified per country and period: Carpathian Basin (n= total no. of records per country)

		Romania (n=12)	Hungary (n=130)	Bosnia Herzegovina (n=10)	Croatia (n=5)	Serbia (n=12)	Total no. (n=169)
Mid/Late Neolithic	Tell	2	8	5	-	6	21
	Flat	1	41	5	-	1	48
	Cave	-	-	-	1	-	1
Copper Age	Tell	-	1	-		1	2
	Flat	-	25	-	1	-	26
	Cave	1	-	-	1	-	2
Bronze Age	Tell	7	18	-	1	4	30
	Flat	1	37	-	1	-	39
	Cave	-	-	-	-	-	-

Table 8.7. Number of records identified as a tell, flat or cave settlement for each country per period (n= total no. of records per country)

Period	M/LN	CA	BA	Total
No. of records	78	39	73	190
GRAIN				
Hordeum vulgare	48%	60%	65%	56%
Triticum dicoccum	63%	58%	65%	62%
Triticum monococcum	54%	45%	51%	51%
Triticum spelta	14%	13%	19%	15%
T. aestivum/durum	19%	23%	41%	27%
"New glume wheat"	4%	-	1%	1%
Secale cereale	3%	5%	14%	4%
Avena sativa	-	-	1%	1%
Panicum miliaceum	17%	15%	38%	24%
Setaria italica	1%	8%	1%	4%
CHAFF				
Hordeum vulgare rachis	11%	8%	7%	9%
Triticum dicoccum g/b	19%	13%	36%	24%
Triticum monococcum g/b	17%	15%	34%	23%
Triticum spelta g/b	6%	13%	11%	8%
"New glume wheat" g/b	4%	3%	1%	3%
T.aestivum/durum rachis	1%	5%	5%	4%
PULSES				
Lathyrus sativus	10%	-	7%	7%
Lens culinaris	31%	10%	35%	28%
Pisum sativum	27%	8%	28%	24%
Vicia ervilia	5%	5%	19%	10%
Vicia faba	4%	-	11%	6%
Cicer arietinum	-	-	1%	1%
OIL PLANTS				
Camelina sativa	1%	-	7%	3%
Linum usitatissimum	11%	15%	4%	9%
Papaver somniferum	-	-	1%	1%

Table 8.8. Frequency of crop species per record for each period: Carpathian Basin

Period	Romania	Hungary	Bosnia Herzegovina	Croatia	Serbia
No. of records	2	49	10	9	10
GRAIN					
Hordeum vulgare	50%	57%	70%	56%	27%
Triticum dicoccum	50%	55%	100%	78%	55%
Triticum monococcum	100%	39%	80%	100%	55%
Triticum spelta	50%	14%	-	33%	-
T. aestivum/durum	50%	24%	20%	44%	18%
"New glume wheat"	100%	2%	-	-	-
Secale cereale	50%	4%	-	11%	-
Avena sativa	-	-	-	-	-
Panicum miliaceum	50%	16%	30%	11%	9%
Setaria italica	-	2%	-	11%	-
CHAFF					
Hordeum vulgare rachis	50%	12%	-	22%	9%
Triticum dicoccum g/b	50%	12%	-	22%	9%
Triticum monococcum g/b	50%	2%	80%	44%	9%
Triticum spelta g/b	-	2%	10%	44%	-
"New glume wheat" g/b	-	-	-	44%	-
T.aestivum/durum rachis	50%	-	-	-	-
PULSES					
Lathyrus sativus	-	8%	10%	22%	9%
Lens culinaris	50%	24%	40%	56%	27%
Pisum sativum	50%	27%	30%	22%	27%
Vicia ervilia	50%	2%	-	22%	-
Vicia faba	50%	-	-	-	-
Cicer arietinum	-	-	-	-	-
OIL PLANTS					
Camelina sativa	-	2%	-	-	-
Linum usitatissimum	50%	6%	30%	22%	9%
Papaver somniferum	-	-	-	-	-

Table 8.9. Frequency of crop species per country: Mid/Late Neolithic Carpathian Basin

Period	Romania	Hungary	Bosnia Herzegovina	Croatia	Serbia
No. of records	2	26	0	11	1
GRAIN					
Hordeum vulgare	-	81%	-	55%	100%
Triticum dicoccum	50%	50%	-	64%	100%
Triticum monococcum	100%	27%	-	64%	100%
Triticum spelta	50%	8%	-	18%	-
T. aestivum/durum	100%	15%	-	36%	100%
"New glume wheat"	-	-	-	-	-
Secale cereale	-	4%	-	18%	-
Avena sativa	-	-	-	-	-
Panicum miliaceum	50%	8%	-	18%	100%
Setaria italica	-	-	-	18%	-
CHAFF					
Hordeum vulgare rachis	-	8%	-	-	-
Triticum dicoccum g/b	-	-	-	36%	-
Triticum monococcum g/b	-	-	-	45%	-
Triticum spelta g/b	-	-	-	18%	-
"New glume wheat" g/b	-	-	-	9%	-
T.aestivum/durum rachis	-	-	-	9%	-
PULSES					
Lathyrus sativus	-	-	-		
Lens culinaris	-	4%	-	9%	100%
Pisum sativum	50%	4%	-	9%	-
Vicia ervilia	-	-	-	9%	100%
Vicia faba	-	-	-	-	-
Cicer arietinum	-	-	-	-	-
OIL PLANTS					
Camelina sativa	-	-	-	-	-
Linum usitatissimum	-	4%	-	27%	100%
Papaver somniferum	-	-	-	-	-

Table 8.10. Frequency of crop species per country: Copper Age Carpathian Basin

Period	Romania	Hungary	Bosnia Herzegovina	Croatia	Serbia
No. of records	9	55	0	6	3
GRAIN					
Hordeum vulgare	67%	91%	-	33%	67%
Triticum dicoccum	67%	65%	-	33%	100%
Triticum monococcum	67%	49%	-	17%	100%
Triticum spelta	11%	20%	-	-	33%
T. aestivum/durum	44%	36%	-	17%	100%
"New glume wheat"	-	-	-	-	-
Secale cereale	11%	15%	-	-	-
Avena sativa	-	-	-	17%	-
Panicum miliaceum	22%	35%	-	67%	67%
Setaria italica	-	-	-	17%	-
CHAFF					
Hordeum vulgare rachis	-	8%	-	-	-
Triticum dicoccum g/b	-	44%	-	-	67%
Triticum monococcum g/b	11%	38%	-	-	67%
Triticum spelta g/b	-	13%	-	-	-
"New glume wheat" g/b	-	-	-	-	33%
T.aestivum/durum rachis	-	-	-	-	-
PULSES					
Lathyrus sativus	-	5%	-	17%	-
Lens culinaris	11%	36%	-	17%	100%
Pisum sativum	11%	27%	-	17%	100%
Vicia ervilia	11%	15%	-	17%	100%
Vicia faba	11%	9%	-	17%	-
Cicer arietinum	-	2%	-	-	-
OIL PLANTS					
Camelina sativa	-	4%	-	-	67%
Linum usitatissimum	-	2%	-	-	33%
Papaver somniferum	-	2%	-	-	-

Table 8.11. Frequency of crop species per country: Bronze Age Carpathian Basin

Phase	Site	No. of samples	Average sample size	Median seed density per litre (not inc. indet)	100: total no. per sample	300: total no. per sample
MN	VIRBRE	5	11	0.1	1000	3000
LN	IVAGAJ	14	11	0.1	1000	3000
CA	PAJVEL	23	11	0.1	1000	3000
LN/CA/BA	TOMPAL	55	11	0.2	500	1500
LN	CISMAV*	34	8	0.2	500	1500
LBA	MACCRI*	25	11	0.2	500	1500
LBA	ORUVES*	2	11	0.2	500	1500
LN	SOPOT*	144	20	0.3	333	1000
CA	JURSTV	12	11	0.3	333	1000
LBA	CRIOST*	3	11	0.3	333	1000
CA	VIRBAT	3	11	0.4	250	750
CA	ĐAKFRA	29	11	0.7	143	429
CA	POTOCA	1	55	1	100	300
CA	VUCEDO	35	11	1	100	300
LN	TURPEC*	22	14	2	50	150
LN/CA	SLAVCA*	97	11	2	50	150
CA	RAVNOK*	60	11	2	50	150
CA	VINMAG*	4	54	8	13	38

Table 10.1. The ideal sample volume for each site (based on the median seed density not including unidentified fragments) to achieve 100 and 300 seeds per sample: All 18 Croatian sites
* 250 micron sieve used