## Supplementary Information

# First molecular and isotopic evidence of millet processing in prehistoric pottery vessels

Carl Heron, Shinya Shoda, Adrià Breu Barcons, Janusz Czebreszuk, Yvette Eley, Marise Gorton, Wiebke Kirleis, Jutta Kneisel, Alexandre Lucquin, Johannes Müller, Yastami Nishida Joon-ho Son, Oliver E. Craig

**Supplementary Table 1 – Heron *et al.***
**First molecular and isotopic evidence of millet processing in prehistoric pottery vessels**

| | | $\delta^{13}C$ (‰) | % Carbon | $\delta^{15}N$ (‰) | % Nitrogen | Atomic C/N ratio |
|---|---|---|---|---|---|---|
| **EBA (*n* = 24)** | | | | | | |
| | F14076ID12960 | -26.2 | 16.9 | 5 | 2.2 | 8.8 |
| | F6122ID7932 | -27.8 | 34.3 | 6.4 | 3.7 | 11 |
| | F4311ID4409 | -24 | 45.8 | 5.2 | 4.6 | 11.6 |
| | F14200ID14074 | -24.8 | 29.1 | 6.1 | 1 | 34.7 |
| | F11808ID12284 | -24.2 | 20.1 | 5.3 | 1.3 | 18.7 |
| | F11806ID12385 | -26.4 | 27.2 | 4.8 | 1.6 | 20.6 |
| | F14076ID12960 | -26.2 | 24.3 | 5.0 | 2.2 | 12.5 |
| | F11199ID9973 | -26.7 | 42.5 | 4 | 1.1 | 44.3 |
| | F6152ID7884 | -25.3 | 51.5 | 5.6 | 2.9 | 20.4 |
| | F8276ID6467 | -24.6 | 55.4 | 3.8 | 2.1 | 30.8 |
| | F8506ID6567 | -24.8 | 30.6 | 6.7 | 3 | 12.1 |
| | F8513ID6694 | -25.0 | 39.8 | 7 | 7.8 | 5.9 |
| | F8546ID6561 | -25.0 | 47 | 6.1 | 3.4 | 16.3 |
| | F8556ID6708 | -26.4 | 41 | 6.8 | 3.3 | 14.3 |
| | F8595ID6697 | -24.3 | 47.2 | 4.9 | 2.3 | 24.6 |
| | F1138ID2847 | -25.2 | 33.8 | 7 | 3.2 | 12.3 |
| | F1380ID1776 | -26.0 | 39.8 | 5.8 | 4.2 | 11.1 |
| | F14646ID14639 | -24.7 | 32.5 | 6.5 | 2.3 | 16.9 |
| | F14697ID14664 | -24.4 | 32.3 | 8.5 | 3.4 | 11.2 |
| | F2149ID1267 | -24.3 | 45.7 | 6.2 | 3.2 | 16.6 |
| | F4308ID4473 | -24.9 | 45.6 | 6.4 | 2.5 | 21.1 |
| | F4308ID4475 | -26.2 | 35.8 | 6.8 | 5.4 | 7.6 |
| | F4420ID4357 | -25.2 | 35 | 4.2 | 1.4 | 29.2 |
| | F4424ID4350 | -24.5 | 44 | 7.1 | 3.3 | 15.3 |
| | Mean | -25.3 | 37.4 | 5.9 | 3 | 17.8 |
| | Standard deviation | 1.0 | 9.8 | 1.1 | 1.5 | 9.1 |

| | | | | | | |
|---|---|---|---|---|---|---|
| **Mostly EBA (*n* = 15)** | | | | | | |
| | F4401ID4376 | -24.4 | 54 | 6.8 | 4.1 | 15.5 |
| | F11154ID10227 | -23.6 | 34.5 | 8.4 | 5.4 | 7.3 |
| | F7164ID2984 | -26.6 | 33.6 | 3.9 | 1.2 | 31.1 |
| | F9105ID7293 | -13.1 | 47.8 | 3.9 | 2.8 | 19.9 |
| | F1103ID2782 | -24.3 | 34.7 | 5.4 | 3.6 | 11.1 |
| | F4141ID3941 | -22.3 | 28 | 5.4 | 3.1 | 10.6 |
| | F4203ID4093 | -25.2 | 22.1 | 2.6 | 1.8 | 14.2 |
| | F4207ID4257 | -24.6 | 43.6 | 4.9 | 2.1 | 24.2 |
| | F4354ID4388 | -24.5 | 39.5 | 2.4 | 1.6 | 29.9 |
| | F4399ID4564 | -24.8 | 44.1 | 5.8 | 2.6 | 19.4 |
| | F4418ID4429 | -24.6 | 47.9 | 3.5 | 3.2 | 13.8 |
| | F7173ID2933 | -26.6 | 33.6 | 3.9 | 1.2 | 31.1 |
| | F2336ID1460 | -26.6 | 16.4 | 4.3 | 1.3 | 15.2 |
| | F7170ID4890 | -26.5 | 38.7 | 1 | 1 | 46.1 |
| | F3114ID521 | -20.3 | 35.8 | 4.8 | 2.5 | 16.6 |
| | Mean | -23.9 | 37 | 4.5 | 2.5 | 20.4 |
| | Standard deviation | 3.4 | 10 | 1.8 | 1.2 | 10.3 |
| | | | | | | |
| **LBA/EIA (*n* = 22)** | | | | | | |
| | F5044ID5396 | -18.3 | 48.1 | 3.8 | 3 | 19 |
| | F5018ID5071 | -27.2 | 34.6 | 0.7 | 1.4 | 19.2 |
| | F4382ID4528 | -23.9 | 34.4 | 7 | 4 | 9.9 |
| | F4096ID3693 | -25.5 | 50.1 | 5.8 | 5.1 | 11.6 |
| | F4088ID3699 | -16.6 | 49.3 | 4.8 | 1.6 | 37.4 |
| | F2344ID1523 | -25.8 | 31.8 | 5.1 | 2.3 | 16.6 |
| | F1428ID1810 | -18.9 | 44.7 | 2.9 | 2.3 | 23.3 |
| | F12384ID18300 | -26.5 | 23.9 | 4.7 | 1 | 28.4 |
| | F1045bID2594 | -18.6 | 47.3 | 7.6 | 4.2 | 13.1 |
| | F5017ID4992 | -11.8 | 23.9 | 4.6 | 2.2 | 20.9 |

| | | | | | | |
|---|---|---|---|---|---|---|
| | F5020ID5135 | -15.5 | 43.9 | 3.3 | 3.1 | 16.6 |
| | F6057ID7828 | -20.4 | 38.7 | 3.8 | 2.2 | 20.2 |
| | F7061ID4765 | -23.4 | 38.1 | 12.6 | 5.1 | 8.8 |
| | F7063ID4698 | -15.3 | 53.9 | 2.8 | 2.3 | 28.1 |
| | F9171ID7454 | -22.8 | 42.9 | 6.4 | 2.2 | 22.2 |
| | F1032ID2277 | -16 | 48.2 | 3.9 | 2.7 | 21.2 |
| | F1033ID1943 | -21.5 | 46.9 | 3.5 | 5.1 | 10.9 |
| | F4088ID3707 | -19.3 | 19.4 | 8.1 | 1.4 | 19.4 |
| | F4155ID3875 | -19.4 | 42.1 | 1.1 | 4 | 12.1 |
| | F4187ID4127 | -20.5 | 36.5 | 4.6 | 5.1 | 8.4 |
| | F4211ID4280 | -24.8 | 36.7 | 4.5 | 1.6 | 27.8 |
| | F4378ID4377 | -24.8 | 53.6 | 3 | 2.2 | 27.9 |
| | Mean | -20.8 | 40.4 | 4.8 | 2.9 | 19.2 |
| | Standard deviation | 4.2 | 9.6 | 2.5 | 1.3 | 7.6 |

**Supplementary Table 1** - Bulk carbon and nitrogen isotope data obtained on sixty-one charred visible deposits (foodcrusts) samples Bruszczewo, Poland

| Lab. Code | Site | Period | Lipid conc. (μg $g^{-1}$) | Major compounds detected | miliacin (AME) | miliacin (TLE) | $C_{16:0}$ $\delta^{13}C$ (‰) | $C_{18:0}$ $\delta^{13}C$ (‰) |
|---|---|---|---|---|---|---|---|---|
| MJR01 | Majeon-ri | LBA | 35 | FA($C_{10:0-26:0,}$ $C_{16:1-18:1}$), DC($C_{10}$), cholesterol, β-sitosterol, *n*-alkanol ($C_{14-30}$) | | | -29.0 | -29.4 |
| MJR02 | Majeon-ri | LBA | 120 | FA($C_{9:0-28:0,}$ $C_{18:1,}$ $C_{17br}$), DC($C_{6,\ 7,\ 14}$), DAG, *n* -alkanol ($C_{24-36}$), $K_{31}$ | Y | | -27.3 | -25.6 |
| MJR03 | Majeon-ri | LBA | 29 | FA($C_{11:0-30:0,}$ $C_{18:1-22:1,}$ $C_{12,\ 15,\ 17br}$), DC($C_{8,\ 9}$), levoglucosan cholesterol, β-sitosterol,, 1-alkanol ($C_{14-30}$) | Y | Y | | |
| MJR04 | Majeon-ri | LBA | 109 | FA($C_{10:0-26:0,}$ $C_{18:1,}$ $C_{17br}$), DC($C_{9-12}$), phy, cholesterol, campesterol, β-sitosterol | | | -26.8 | -25.7 |
| MJR05 | Majeon-ri | LBA | 20 | FA($C_{12:0-24:0,}$ $C_{18:1-22:1,}$ $C_{15,\ 17br}$), cholesterol, campesterol, β-sitosterol | | | | |
| MJR06 | Majeon-ri | LBA | 155 | FA($C_{10:0-30:0,}$ $C_{18:1-22:1,}$ $C_{15br}$), DC($C_{7-13}$), APFA($C_{18}$), phy, β-sitosterol(tr), stigmastanol | | | -19.6 | -17.9 |
| MJR07 | Majeon-ri | LBA | 25 | FA($C_{12:0-26:0,}$ $C_{16:1-22:1,}$ $C_{15,\ 17br}$), DC($C_9$), cholesterol (tr) | | | | |
| MJR08 | Majeon-ri | LBA | 38 | FA($C_{12:0-30:0,}$ $C_{18:1-22:1,}$ $C_{15,\ 17br}$), DC($C_9$), APFA($C_{18tr}$), cholesterol, cholestanol, campesterol, stigmasterol, β-sitosterol, stigmastanol, | Y | Y | -26.8 | -27.1 |
| MJR09 | Majeon-ri | LBA | 117 | FA($C_{14:0-30:0,}$ $C_{18:1-22:1,}$ $C_{17br}$), DC($C_{9-11}$), *n*-alkane ($C_{25-33}$), *n*-alkanol ($C_{24-36}$), stigmastanol, cholestanone, stigmastanone, $K_{31}$ | Y | Y | -24.9 | -21.6 |
| MJR10 | Majeon-ri | LBA | 123 | FA($C_{8:0-30:0,}$ $C_{18:1,}$ $C_{17br}$), DC($C_9$), stigmastanol | Y | Y | -19.3 | -20.0 |
| MJR11 | Majeon-ri | LBA | 19 | FA($C_{14:0-26:0,}$ $C_{18:1-22:1,}$ $C_{15,\ 17br}$) | Y | | | |
| MJR12 | Majeon-ri | LBA | 32 | FA($C_{14:0-26:0,}$ $C_{18:1-22:1,}$ $C_{15,\ 17br}$), DC($C_9$), cholesterol | Y | Y | | |
| MJR13 | Majeon-ri | LBA | 17 | FA($C_{14:0-18:0,}$ $C_{18:1-22:1,}$ $C_{17br}$), cholesterol | | | | |
| MJR14 | Majeon-ri | LBA | 19 | FA($C_{14:0-24:0,}$ $C_{16:1-22:1,}$ $C_{15,\ 17br}$), cholesterol | | | | |
| MJR15 | Majeon-ri | LBA | 23 | FA($C_{14:0-26:0,}$ $C_{18:1-22:1,}$ $C_{15br}$), cholesterol, β-sitosterol (tr) | | | | |

**Supplementary Table 2** – Molecular and compound-specific carbon isotope data obtained by analysis of pottery vessel sherds from Majeon-ri, Korea. Key to the molecular data: FA($C_{n:x}$) – fatty carboxylic acids with carbon length *n* and number of unsaturations *x*, branched-chain carboxylic acids identified as FA($C_{n\mathrm{br}}$); *n*-alkanol – alkanol with *n* carbon atoms, DC - α,ω-dicarboxylic acids of chain length $C_n$; APFA - ω-(*o*-alkylphenyl)alkanoic acids of chain length $C_n$; DAG – diacylglycerol; $K_{31}$ – mid-chain ketone with chain-length of 31 carbon atoms; phy – phytanic acid. Detection of miliacin is shown according to extraction method, either acid-methanol (AME) and solvent extraction (TLE).