(P) Yumology (1/4) [Solution]

Inspired by the Patrice Buche, et al. presentation at International Conference on Biomedical Ontologies (ICBO) 2020 Integrated Food Ontology Workshop (IFOW) titled "A new alignment method based on FoodOn as pivot ontology to integrate nutritional legacy data sources." https://foodon.org/icbo-2020-food-workshop/

P1.
(a) mashed. The facets listed for this food mean "potato, root, chunky semi-liquid, cooked."
(b) seeds, roasted. The facets listed for this food mean "pumpkin, seeds/pods, whole, cooked"

P2.
(c) 2400. The food has the same facets as E10.
(d) 107. The food's nearest neighbor is E01.
(e) 209. Looking just at the facets, this food is equally similar to E03 and E11. However, looking at the facet chart, E11 is much closer.

P3. The algorithm is first to select the best EL food match for each YUM food based on the average of path length from each facet in the YUM food to the corresponding facet in the candidate EL food. One step on the path is either moving between a parent and a child, or between two siblings.
Then, if no ties, get the metric (here, K mg/100 g) from the EL food. If there is a tie, then average the K mg/100 g from the tied matches.

P4. B = food origin. C = part of the thing it originates from. E = texture. F = the extent to which it has been treated with heat. A = whether it is dried.

P5.
(a) B1245 = Apple
(b) B1530 = Coconut
(c) C0240 = Leaves
(d) E0310 = Chunky semi-liquid
(e) F0013 = Cooked
(f) F0001 = Unclear whether cooked or not

P6. Salt. (or anything else that is neither an animal nor a plant)

(P) Yumology (2/4) [Solution]

P7. Multiple answers are possible; any answer consistent with all of the facets provided would receive full points.

(a) Y4: Apple slices without skin, air-dried
(b) Y5: Smooth peanut butter. (Also acceptable would be any smooth paste made from cooked nuts, seeds, or pods)
(c) Y6: Chunky peanut butter. (Also acceptable would be any chunky paste made from cooked nuts, seeds, or pods)
(d) Y9: Canned tomato puree. (Also acceptable would be any smooth cooked puree made from any non-root vegetable)

P8. It could help or hurt.

For K mg/100 grams, a powdered product will be much more highly concentrated than the original fresh version, therefore, getting the dried distinction would be important for determining how much potassium there is. However, if the underlying data is sparse in terms of ingredient variety, if using this factor causes a complete switch in plant type, then the K mg per grams may be completely inaccurate, not just miscalibrated by weight. A possible solution to deal with this would be to use a tiered approach, i.e., first find the variety, then from among these, choose the closest to the dried/fresh version.

In general, for other metrics, you may care more about one factor or another, in which case either a factor-weighted or rule-based (tiered) approach would be appropriate. I.e., to find serving size of a liquid, 8 oz may be generalizable, so here variety may matter less, but to find allergen information, variety would basically be the only thing that mattered.

The YUM foods are:

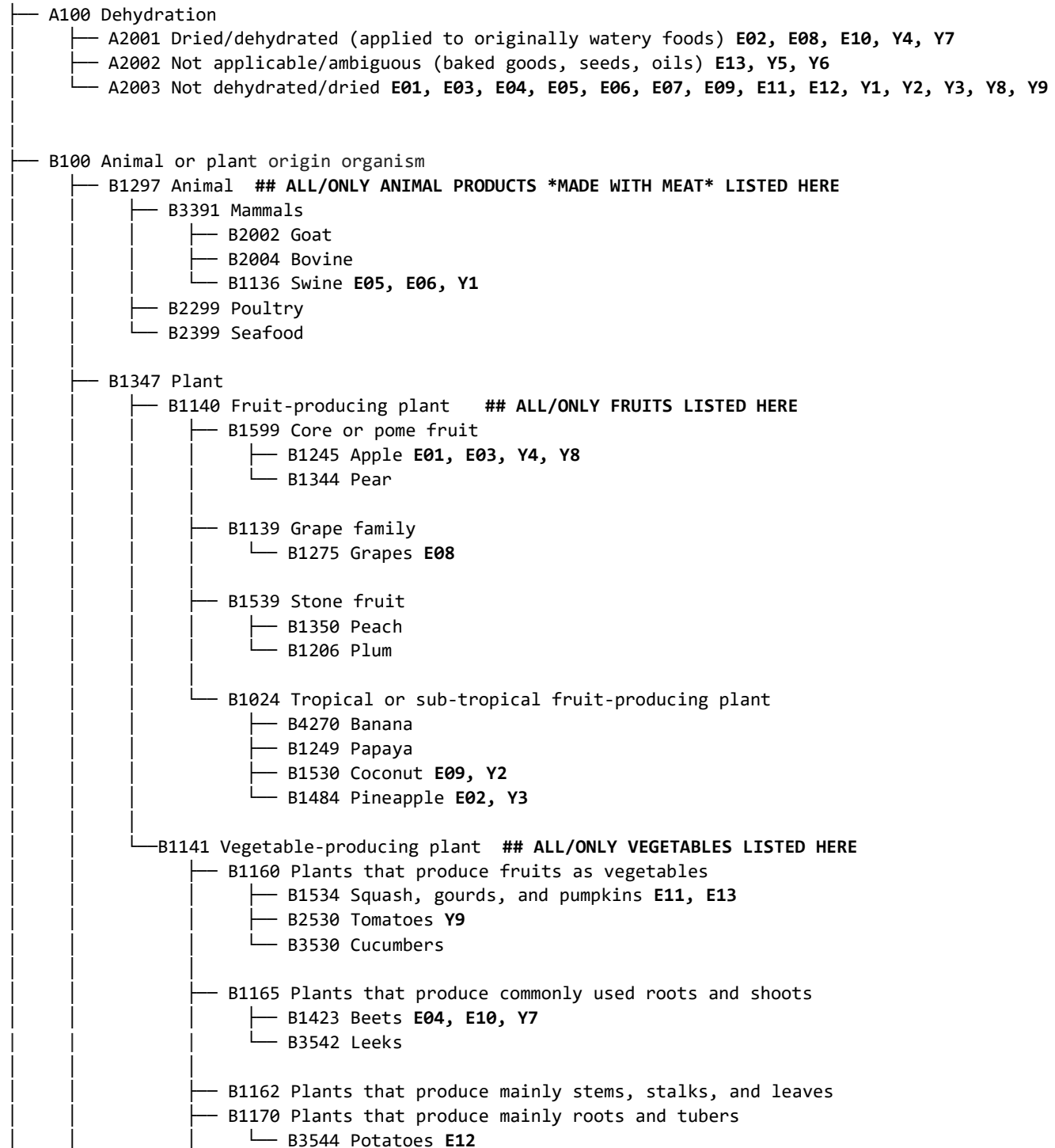| YUM ID	Yum description
Y1	Bacon, raw
Y2	Raw coconut oil
Y3	Pineapple juice, canned
Y4	Apples, air dried w/out skin, slices
Y5	Smooth peanut butter
Y6	Chunky peanut butter
Y7	Beetroot powder, red or golden
Y8	Baked whole apple
Y9	Tomato purée, canned

(P) Yumology (3/4) [Solution]

Full graph with annotations

Based (loosely) on LanguaL — The International Framework for Food Description.
https://www.langual.org/default.asp

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├── A100 Dehydration
│      ├── A2001 Dried/dehydrated (applied to originally watery foods) E02, E08, E10, Y4, Y7
│      ├── A2002 Not applicable/ambiguous (baked goods, seeds, oils) E13, Y5, Y6
│      └── A2003 Not dehydrated/dried E01, E03, E04, E05, E06, E07, E09, E11, E12, Y1, Y2, Y3, Y8, Y9
│
│
├── B100 Animal or plant origin organism
│      ├── B1297 Animal  ## ALL/ONLY ANIMAL PRODUCTS *MADE WITH MEAT* LISTED HERE
│      │      ├── B3391 Mammals
│      │      │      ├── B2002 Goat
│      │      │      ├── B2004 Bovine
│      │      │      └── B1136 Swine E05, E06, Y1
│      │      ├── B2299 Poultry
│      │      └── B2399 Seafood
│      │
│      ├── B1347 Plant
│      │      ├── B1140 Fruit-producing plant   ## ALL/ONLY FRUITS LISTED HERE
│      │      │      ├── B1599 Core or pome fruit
│      │      │      │      ├── B1245 Apple E01, E03, Y4, Y8
│      │      │      │      └── B1344 Pear
│      │      │      │
│      │      │      ├── B1139 Grape family
│      │      │      │      └── B1275 Grapes E08
│      │      │      │
│      │      │      ├── B1539 Stone fruit
│      │      │      │      ├── B1350 Peach
│      │      │      │      └── B1206 Plum
│      │      │      │
│      │      │      └── B1024 Tropical or sub-tropical fruit-producing plant
│      │      │             ├── B4270 Banana
│      │      │             ├── B1249 Papaya
│      │      │             ├── B1530 Coconut E09, Y2
│      │      │             └── B1484 Pineapple E02, Y3
│      │      │
│      │      └──B1141 Vegetable-producing plant  ## ALL/ONLY VEGETABLES LISTED HERE
│      │             ├── B1160 Plants that produce fruits as vegetables
│      │             │      ├── B1534 Squash, gourds, and pumpkins E11, E13
│      │             │      ├── B2530 Tomatoes Y9
│      │             │      └── B3530 Cucumbers
│      │             │
│      │             ├── B1165 Plants that produce commonly used roots and shoots
│      │             │      ├── B1423 Beets E04, E10, Y7
│      │             │      └── B3542 Leeks
│      │             │
│      │             ├── B1162 Plants that produce mainly stems, stalks, and leaves
│      │             ├── B1170 Plants that produce mainly roots and tubers
│      │             │      └── B3544 Potatoes E12
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│      │           │
│      │           └── B1263 Plants that produce mainly pods and seeds
│      │                   ├── B1430 Peanut Y5, Y6
│      │                   └── B1452 Soybean E07
│      │
│      └── B1348 Minerals
│
├── C. Part of plant or animal
│      ├── C3001 Part of plant
│      │      ├── C0760 Roots, stems, leaves, flowers
│      │      │      ├── C0140 Roots, tubers, bulbs E10, E12, Y7
│      │      │      ├── C0240 Stems, leaves, stalks E03
│      │      │      └── C0243 Flowers, florets
│      │      └── C0654 Fruit or seed
│      │             ├── C0120 Pod or seeds only E07, E13, Y5, Y6
│      │             ├── C0128 Fruit ## BELOW DISTINGUISHES APPLE (PARTS USED)
│      │             │      ├── C0121 Fruit with peel E01, E08, Y8
│      │             │      └── C0126 Fruit without peel E02, E03, E11, Y4, Y9
│      │             ├── C0339 Juice or liquid extract E09, Y2, Y3
│      │             └── C0329 Peel only
│      │
│      └── C4322 Part of animal
│             ├── C2345 Eggs and dairy
│             └── C2545 Animal body or body part
│                    ├── C5545 Cartilage
│                    ├── C4545 Skeletal meat part or fat E05, E06, Y1
│                    └── C4546 Organ
│
├── E. Physical state, shape, or form
│      ├── E0130 Liquid
│      │      ├── E0115 Liquid, high viscosity Y2
│      │      └── E0114 Liquid, low viscosity E09, Y3
│      │
│      ├── E0103 Semi-solid-liquid ## PEANUT BUTTER (AMBIGUOUS, CAN BE BOTH)
│      │      ├── E0215 Semi-solid-liquid, smooth E03, E11, E13, Y5, Y9
│      │      └── E0310 Semi-solid-liquid, chunky E12, Y6
│      │
│      └── E0152 Solid
│             ├── E0122 Divided or disintegrated
│             │      ├── E0132 Coarsely ground or grated
│             │      ├── E0133 Sliced or diced E02, E05, E06, E07, Y1, Y4
│             │      └── E1152 Powdered E10, Y7
│             └── E0151 Whole E01, E04, E08, Y8
│
│
└── F. Extent of heat treatment
            ## MUST LIST COOKED OR BE IMPLIED (CANNING, MASHED POTATOES)
       ├── F0013 Fully heat treated  E02, E03, E07, E11, E12, E13, Y3, Y5, Y6, Y8, Y9
       ├── F0001 Whether fully heat treated is not known E05, E08, E10, Y7 ## AMBIGUOUS
       └── F0003 Not heat-treated E01, E04, E06, E09, Y1, Y2, Y4 ## MUST LIST RAW/FRESH, etc.
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