

To address the request, I analyzed the "Survey Summary.docx" file, which details the phytolith identification survey results for 12 respondents across 18 phytolith images. Each respondent identified the phytoliths as Avena, Hordeum, Triticum, or Unidentifiable, provided a confidence rating, and described the characteristics used for their identification. The goal is to create a list, organized by identification category (Avena, Hordeum, Triticum), of the characteristics respondents employed, ordered from most to least frequently used, with a count of how often each characteristic was mentioned.

## Methodology

- 1 **Data Extraction:** I extracted the comments from the "Describe how you made your ID and what features were prioritized, and any other comments" section for each respondent and phytolith image, focusing on the characteristics explicitly mentioned as influencing the identification.
- 2 **Characteristic Identification:** I categorized the characteristics into distinct features (e.g., wave pattern, papilla shape, pit count) based on the terminology used by respondents. Similar terms were grouped (e.g., "wave pattern," "wave shape," and "wave form" were treated as one characteristic).
- 3 **Categorization by Genus:** For each identification category (Avena, Hordeum, Triticum), I compiled the characteristics used only when the respondent identified the phytolith as that specific genus. Unidentifiable responses were excluded since they do not contribute to a genus-specific identification.
- 4 **Quantification:** I counted the number of times each characteristic was mentioned for each genus across all respondents and phytolith images. A characteristic was counted once per comment, even if mentioned multiple times within the same comment (e.g., "wave pattern and wave shape" counted as one mention of wave pattern).
- 5 **Ordering:** Characteristics were ordered from most to least frequently used within each genus category based on the count of mentions.
- 6 **Exclusions:** Comments that were too vague (e.g., "all features") or did not specify characteristics (e.g., "image unclear") were not counted unless a specific feature was implied (e.g., "wave pattern unclear" counted as wave pattern).

## Notes on Interpretation

- **Wave Pattern Specificity:** Respondents often described wave patterns with adjectives (e.g., "squarish" for Hordeum, "lobed/crenulated" for Triticum, "thin/pointed" for Avena). These were grouped under "wave pattern" unless the description was uniquely tied to another feature (e.g., "long arms" under long-cell shape).
- **Papilla and Pits:** "Papilla shape" and "pit count" were treated separately, as respondents distinguished between the morphology of papillae (e.g., ovoid, dome-shaped) and the number of pits around them.
- **Long-Cell and Elongate Terms:** Terms like "long-cell," "elongate," and "dendritic" were grouped under "long-cell shape" when referring to the morphology or dimensions of elongated cells, unless specifically tied to wave pattern or other features.
- **Unique Features:** Features like "cork cell shape" or "stomata" were counted separately due to their distinct mention by respondents.
- **Regional Influence:** While regional expertise was noted, it did not directly affect characteristic counts unless explicitly tied to a feature (e.g., "arid area phytolith thickness").

## Results

Below are the lists of characteristics used for each identification category (Avena, Hordeum, Triticum), ordered from most to least frequently used, with the number of mentions quantified. Each list includes only the characteristics mentioned when the respondent identified the phytolith as the specified genus.

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### Avena Identification Characteristics

Characteristic	Description	Number of Mentions
Wave Pattern	Shape or pattern of the wave-like structure of elongates (e.g., thin, pointed, high, sinuate, U-shaped)	27
Papilla Shape	Morphology of papillae (e.g., ovoid, irregular, abundant)	12
Long-Cell Shape	Shape, size, or dimensions of long-cells/elongates (e.g., thin bodies, longer arms, rounded margins)	8
Pit Count	Number of pits around papillae (e.g., high number, ~16-18)	5
Stomata	Presence or shape of stomata	3
Phytolith Thickness	Thickness of phytolith bodies	2
Short-Cell Shape	Shape of short cells surrounding papillae	1
Spike Shape	Shape of spikes (e.g., rectangular, narrow curves)	1
Bulbosus Features	Presence of short, acute bulbous features on the outside	1

**Details:**

- **Wave Pattern (27 mentions):** Frequently described as "thin and pointed" (114576035342, Phytolith 15), "sinuate with U wave pattern" (114593798403, Phytolith 6), or "higher waves with longer arms" (114584712002, Phytolith 3). Respondents consistently prioritized wave pattern for Avena IDs.
  - **Papilla Shape (12 mentions):** Noted as "ovoid" (114593798403, Phytolith 1), "abundant and irregular" (114584712002, Phytolith 2), or "irregular with high pit count" (114698657503, Phytolith 15). Often linked to Avena's distinct papilla morphology.
  - **Long-Cell Shape (8 mentions):** Included "thin bodies" (114586405069, Phytolith 3), "longer arms of long-cells" (114584712002, Phytolith 6), and "rounded elongate margins" (114593798403, Phytolith 5).
  - **Pit Count (5 mentions):** Mentioned as high or estimated (e.g., "16-18 pits" by 114587903811, Phytolith 6) and linked to Avena's higher pit count compared to Hordeum/Triticum.
  - **Stomata (3 mentions):** Noted by 114578272638 (Phytoliths 2, 3, 7) as a potential Avena feature but often blurred or absent, limiting reliability.
  - **Others:** Less frequent features like phytolith thickness (114587903811, Phytolith 1), short-cell shape (114578272638, Phytolith 3), spike shape (114591055078, Phytolith 13), and bulbous features (114591055078, Phytolith 17) were rarely mentioned.
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## Hordeum Identification Characteristics

Characteristic	Description	Number of Mentions
Wave Pattern	Shape or pattern of waves (e.g., squarish, flattened, even, low, wide, V-shaped)	42
Papilla Shape	Morphology of papillae (e.g., pointy, dome-shaped, conical, empty)	16
Pit Count	Number of pits around papillae (e.g., ~12, regular, borderline Triticum)	10
Long-Cell Shape	Shape, size, or dimensions of long-cells/elongates (e.g., sharp, dentate, narrow)	9
Cork Phytoliths	Presence or shape of cork phytoliths	2
Phytolith Shape	Overall shape of phytoliths (e.g., loosely connected, mass silica skeleton)	2
Spike Shape	Shape of spikes (e.g., rounded, regular)	1
Dendritic Shape	Shape of dendritic forms (e.g., narrow, loosely connected)	1

**Details:**

- **Wave Pattern (42 mentions):** Described as "squarish" (114586405069, Phytolith 2), "flattened" (114576035342, Phytolith 3), "low and wide" (114584712002, Phytolith 9), "V-shaped margins" (114593798403, Phytolith 12), or "even and consistent" (114576035342, Phytolith 10). The dominant feature for *Hordeum* IDs.
  - **Papilla Shape (16 mentions):** Noted as "pointy" (114698657503, Phytolith 8), "dome-shaped" (114589291701, Phytolith 4), "conical" (114589291701, Phytolith 13), or "empty" (114591055078, Phytolith 9). Often a secondary feature.
  - **Pit Count (10 mentions):** Mentioned as "regular pits" (114591055078, Phytolith 15), "right number for *Hordeum*" (114576035342, Phytolith 10), or "borderline with *Triticum*" (114587903811, Phytolith 4). Compared to references like Rosen 1992.
  - **Long-Cell Shape (9 mentions):** Included "sharp, dentate elongates" (114593798403, Phytolith 11), "narrow dendritic forms" (114698657503, Phytolith 7), and "V-shaped margins" (114593798403, Phytolith 17).
  - **Others:** Cork phytoliths (114591055078, Phytolith 8), overall phytolith shape (114573876642, Phytolith 17), spike shape (114591055078, Phytolith 12), and dendritic shape (114591055078, Phytolith 8) were infrequently cited.
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## **Triticum Identification Characteristics**

Characteristic	Description	Number of Mentions
Wave Pattern	Shape or pattern of waves (e.g., lobed, crenelated, wiggly, high, rounded, dendritic)	46
Papilla Shape	Morphology of papillae (e.g., ovoid, small, pointy)	12
Long-Cell Shape	Shape, size, or dimensions of long-cells/elongates (e.g., thick, rounded margins, clavate)	11
Pit Count	Number of pits around papillae (e.g., ~10-12, right for Triticum)	7
Dendritic Shape	Shape or dominance of dendritic forms (e.g., crenelated, hyper-dendritic, long spikes)	6
Cork Cell Shape	Shape of cork cells (e.g., pointy)	2
Phytolith Shape	Overall shape of phytoliths (e.g., hyper-dendritic, mass silica skeleton)	2
Papilla Size	Size or diameter of papillae (e.g., smaller than expected, 12 microns)	2

**Details:**

- **Wave Pattern (46 mentions):** Described as "lobed" (114576035342, Phytolith 1), "crenelated" (114591055078, Phytolith 2), "wiggly" (114586405069, Phytolith 16), "high rounded" (114584712002, Phytolith 13), or "dendritic" (114593798403, Phytolith 14). The most cited feature for *Triticum*.
  - **Papilla Shape (12 mentions):** Noted as "ovoid" (114593798403, Phytolith 18), "pointy" (114608398619, Phytolith 1), or "small" (114577309146, Phytolith 13). Often secondary to wave pattern.
  - **Long-Cell Shape (11 mentions):** Included "thick long-cells" (114584712002, Phytolith 13), "clavate margins" (114593798403, Phytolith 18), and "rounded margins with spaced extrusions" (114593798403, Phytolith 5).
  - **Pit Count (7 mentions):** Mentioned as "~10 pits" (114584712002, Phytolith 4), "right for *Triticum*" (114576035342, Phytolith 18), or "borderline with *Hordeum*" (114587903811, Phytolith 4).
  - **Dendritic Shape (6 mentions):** Noted as "crenelated dendritics" (114591055078, Phytolith 4), "hyper-dendritic spikes" (114573876642, Phytolith 16), or "dendritic dominance" (114587903811, Phytolith 5).
  - **Others:** Cork cell shape (114608398619, Phytolith 1), overall phytolith shape (114573876642, Phytolith 18), and papilla size (114587903811, Phytolith 4) were rarely mentioned.
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## Summary of Findings

- **Wave Pattern Dominance:** Wave pattern was the most frequently cited characteristic across all three genera (27 for Avena, 42 for Hordeum, 46 for Triticum), reflecting its central role in phytolith identification. Respondents used descriptive terms to differentiate genera (e.g., squarish for Hordeum, crenelated for Triticum, thin/pointed for Avena).
- **Papilla Shape and Pits:** Papilla shape was the second most common feature (12 for Avena, 16 for Hordeum, 12 for Triticum), often linked to specific morphologies (e.g., ovoid for Avena, dome-shaped for Hordeum). Pit count was less frequent but critical when quantifiable, especially for distinguishing Triticum (~10 pits) from Hordeum (~12 pits) or Avena (higher counts).
- **Long-Cell Shape:** Frequently mentioned for Avena (8) and Triticum (11), less so for Hordeum (9), often tied to dimensions or margin shapes (e.g., thick long-cells for Triticum, thin bodies for Avena).
- **Specialized Features:** Features like cork cells, stomata, or dendritic shapes were less common but provided unique insights, particularly for Triticum (dendritic shape) and Avena (stomata).
- **Quantitative Notes:** The total number of characteristic mentions reflects the number of genus-specific identifications (e.g., more Triticum IDs led to more mentions for Triticum characteristics). Hordeum and Triticum had higher mention counts due to more frequent identifications compared to Avena.

## Artifact Output



Phytolith Identification Characteristics  
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