

Effectiveness of Plant Identification Applications at Identifying Common Plant Species in Forage Systems

A.M. Grev and R.N. Herron¹

¹University of Maryland Extension, Western Maryland Research and Education Center, Keedysville, MD (agrev@umd.edu)

Introduction

- Accurate plant species identification is essential in making management decisions for hay and pasture systems
- Plant identification can sometimes be challenging, especially for non-professionals or inexperienced people
- A wide variety of mobile phone applications are available and offer users the potential to quickly and easily identify plant species
- Accuracy of mobile phone applications at identifying plant species under real-world field conditions within hay and pasture systems is unclear

Objective/Hypothesis

Objective: to test the accuracy of mobile phone identification applications at identifying common plant species found in forage systems

Hypothesis: mobile phone applications will differ in their ability to correctly identify plant species found in forage systems

Materials and Methods

- A total of 30 different plant species (27 broadleaf, 3 grass) were tested on nine popular mobile phone identification applications
- Target plant species included common broadleaf and grass species located in pastures and hayfields in the region
- All plants were photographed on farms under normal field conditions
- For each plant species, three unique images were selected, with priority given to images depicting whole plants in a vegetative state
- Identification applications that were tested (n=9) are shown in Table 1
- Identification performance for each image (n=90) was scored as follows:
 - 4 = top suggestion correct
 - 3 = second suggestion correct
 - 2 = third suggestion correct
 - 1 = genus correctly identified but not species
 - 0 = correct identification not provided

Table 1. Phone applications tested and associated costs

Identification Application	Cost
Picture This	\$39.99/year
iNaturalist	Free
Seek by iNaturalist	Free
PlantSnap	Free (with ads)
LeafSnap	\$25.99/year
PlantNet	Free
Plantum	\$29.99/year
Google Lens	\$39.99/year
Apple Visual Look Up	Free

Figure 1. Logos for phone applications

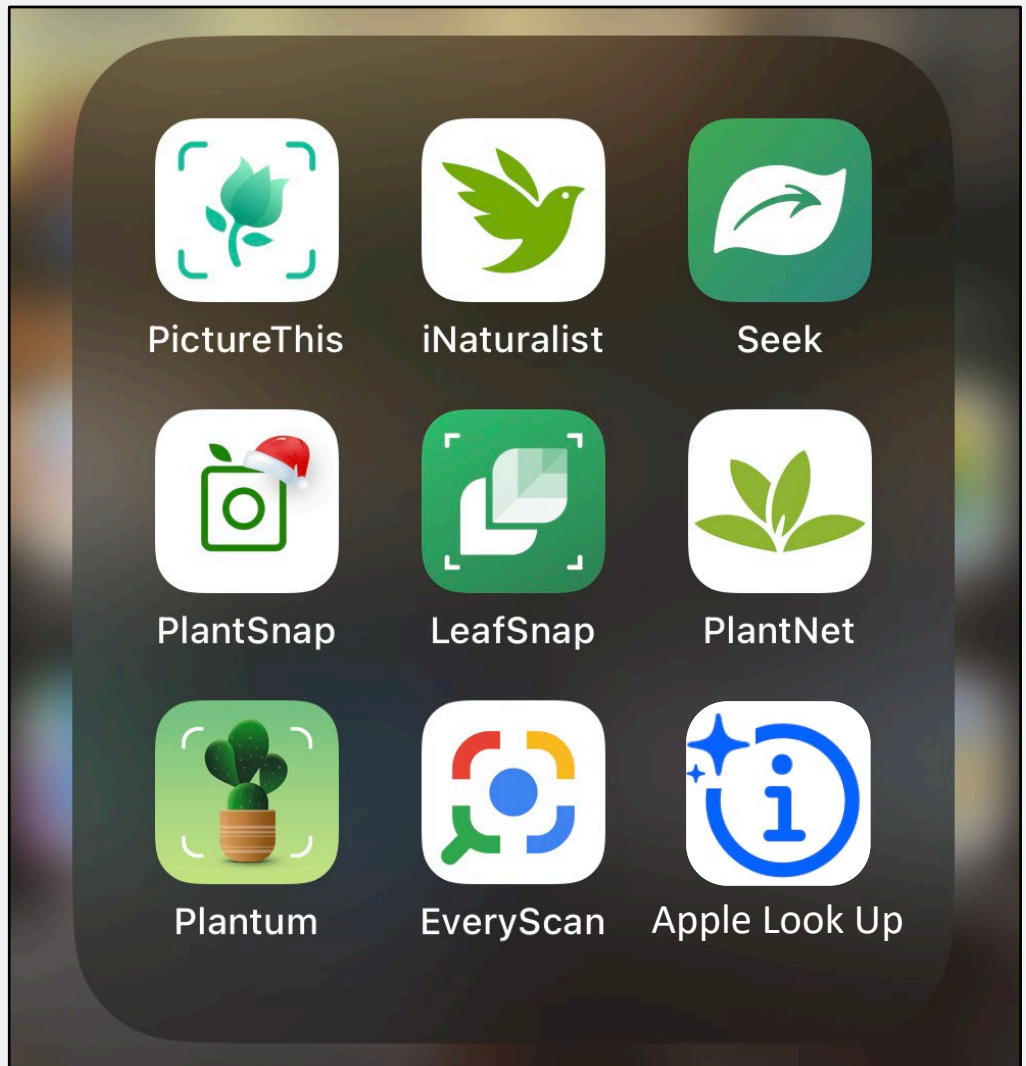


Figure 2. Examples of images (three per plant species) run through phone applications



Table 2. List of plant species used for mobile phone application identification testing

Plant Number	Common Name	Latin Name	Plant Type
1	Broadleaf dock	<i>Rumex obtusifolius</i>	Broadleaf
2	Broadleaf plantain	<i>Plantago major</i>	Broadleaf
3	Buckhorn plantain	<i>Plantago lanceolata</i>	Broadleaf
4	Buttercup	<i>Ranunculus bulbosus</i>	Broadleaf
5	Canada thistle	<i>Cirsium arvense</i>	Broadleaf
6	Cocklebur	<i>Xanthium strumarium</i>	Broadleaf
7	Common mallow	<i>Malva neglecta</i>	Broadleaf
8	Common milkweed	<i>Asclepias syriaca</i>	Broadleaf
9	Common ragweed	<i>Ambrosia artemisiifolia</i>	Broadleaf
10	Curly dock	<i>Rumex crispus</i>	Broadleaf
11	Field mustard	<i>Brassica rapa</i>	Broadleaf
12	Field pennycress	<i>Thlaspi arvense</i>	Broadleaf
13	Fleabane	<i>Erigeron philadelphicus</i>	Broadleaf
14	Giant foxtail	<i>Setaria faberi</i>	Grass
15	Hairy bittercress	<i>Cardamine hirsute</i>	Broadleaf
16	Hemp dogbane	<i>Apocynum cannabinum</i>	Broadleaf
17	Henbit	<i>Lamium amplexicaule</i>	Broadleaf
18	Horsenettle	<i>Solanum carolinense</i>	Broadleaf
19	Johnsongrass	<i>Sorghum halepense</i>	Grass
20	Lambsquarter	<i>Chenopodium album</i>	Broadleaf
21	Marestail	<i>Erigeron Canadensis</i>	Broadleaf
22	Pennsylvania smartweed	<i>Polygonum pensylvanicum</i>	Broadleaf
23	Perilla mint	<i>Perilla frutescens</i>	Broadleaf
24	Pokeweed	<i>Phytolacca americana</i>	Broadleaf
25	Purple deadnettle	<i>Lamium purpureum</i>	Broadleaf
26	Redroot pigweed	<i>Amaranthus retroflexus</i>	Broadleaf
27	Spiny amaranth	<i>Amaranthus spinosus</i>	Broadleaf
28	Velvetleaf	<i>Abutilon theophrasti</i>	Broadleaf
29	Yellow foxtail	<i>Setaria pumila</i>	Grass
30	Yellow woodsorrel	<i>Oxalis stricta</i>	Broadleaf

Results and Discussion

Combined App Performance:

- Across all applications, 61% of images were identified correctly as the first suggestion
- 74% of images were identified correctly within the first three suggestions

Individual App Performance:

- PictureThis was the most accurate application, identifying 94% of tested images correctly on the first suggestion
- Plantum was second (89%), followed by iNaturalist (79%) and PlantNet (66%)

Future Testing Will Include:

- Additional plant species (particularly desirable grasses, legumes, and forbs)
- Additional photos representing a broader range of plant growth stages

Figure 3. Example results output for each mobile phone application during identification testing

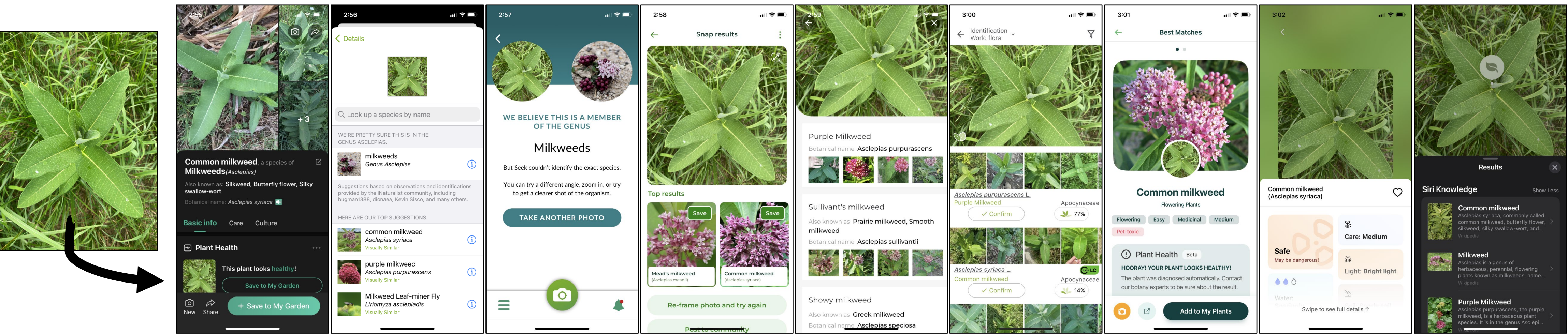


Figure 4. Percent of tested images identified correctly within each scoring category across all mobile phone applications

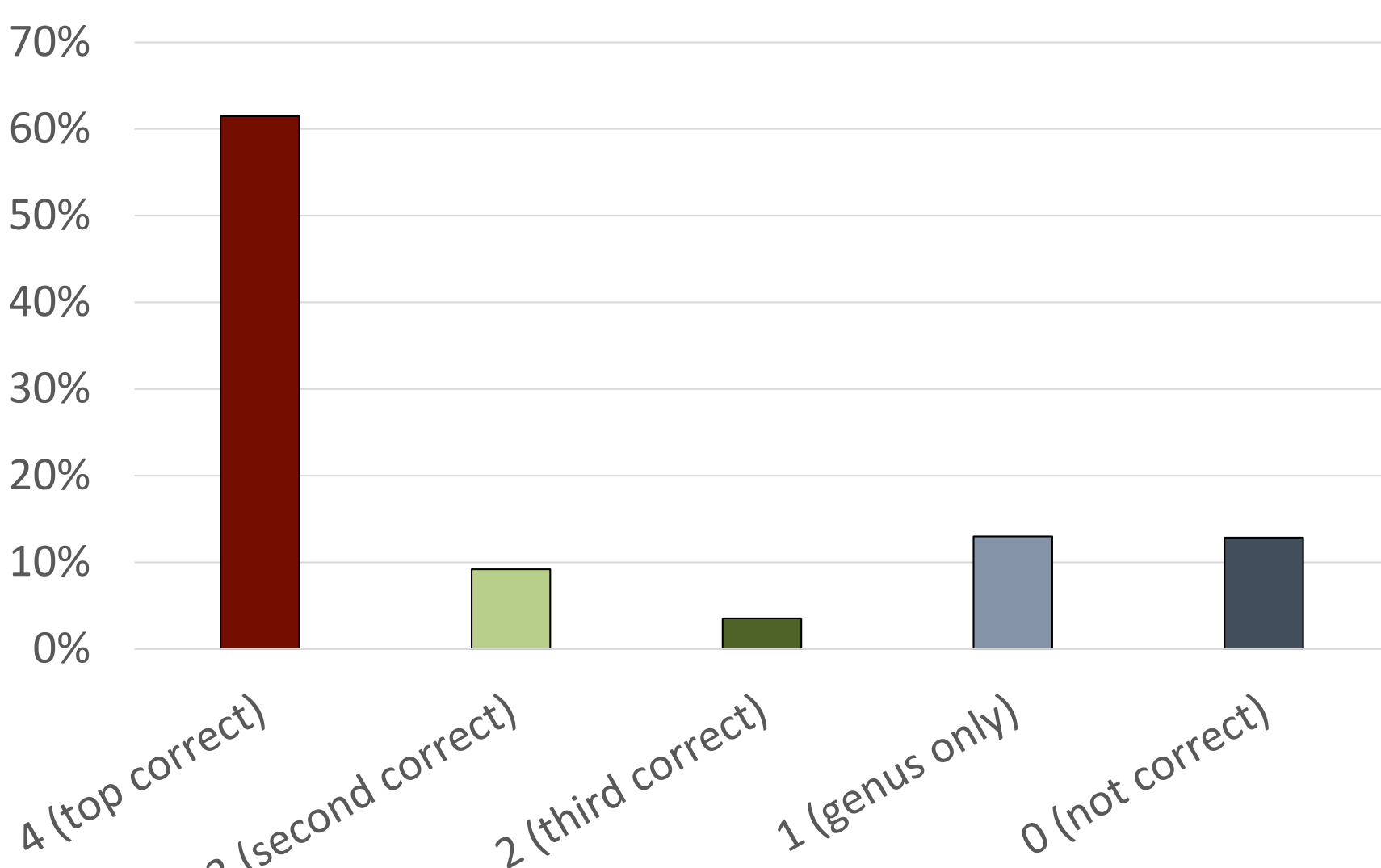


Figure 5. Average score (4 = top suggestion correct; 0 = not correct) for each mobile phone application

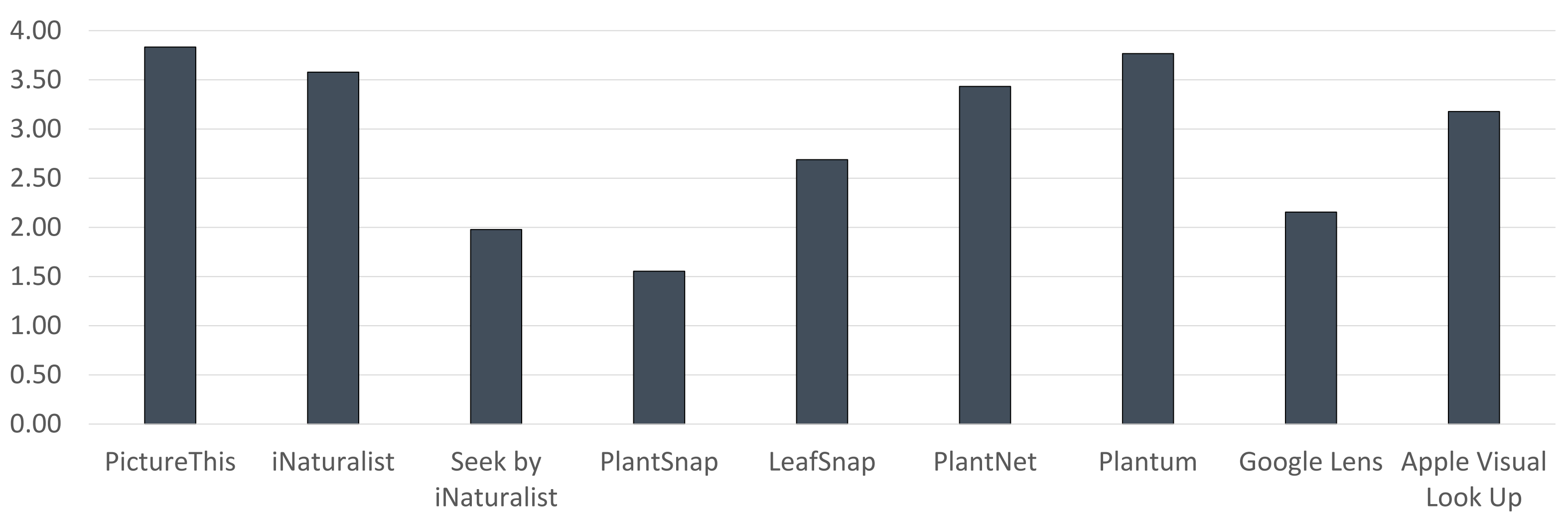


Figure 6. Percent of tested images identified within each scoring category for each mobile phone application

