

# Assessing Master Gardener Practices and Confidence in Responding to Clientele Questions about Home Food Preservation in Texas

Jenna D. Anding<sup>1</sup> and Jayla Fry<sup>2</sup>

**KEYWORDS.** continuing education, extension, knowledge, volunteer

**ABSTRACT.** Interest in home food preservation has grown, especially among those who grow their own produce. Extension Master Gardeners (EMGs) are trained to teach consumers how to produce fruits, vegetables, and herbs, but little is known about how often they are asked questions about how to preserve them or their ability to answer such questions. This study used an online survey to ask EMGs across Texas about their food preservation practices and the extent to which they are asked questions about home food preservation. We also assessed their perceived confidence in answering those questions using a 5-point Likert scale (1 = not confident at all; 5 = very confident). Most (91%) of the 1875 EMGs who responded reported preserving food using one or more methods. More than half ( $n = 1034$ ; 55%) had been asked questions about home food preservation, but their level of confidence in answering those questions ranged from a high of  $3.1 \pm 1.3$  (mean  $\pm$  SD) for freezing fruits and vegetables to a low of  $1.6 \pm 1.1$  for pressure canning low-acid foods. Interest in learning more about home food preservation was high, especially regarding safe practices and recipes, drying herbs, freezing fruits and vegetables, and canning salsa and tomato products. The results suggest that EMG training programs could benefit from including basic information about home food preservation, especially sources of reliable information and recipes.

The Texas Extension Master Gardener (EMG) program has been in existence for more than 45 years. Like all EMG programs across the nation, its mission is to provide quality and relevant horticulture and gardening information to the citizens in local communities. With more than 11,000 registered volunteers, the impact of the Texas EMG program alone is significant. Annually, these individuals contribute more than 500,000 h of

volunteer service, equating to an economic impact of more than \$12 million (Texas EMG 2022).

Texas EMGs receive training comprising a minimum of 50 h of education regarding a variety of topics, including plant growth and development, soils, integrated pest management, fruit and vegetable production, and lawn care. After training, EMGs earn continuing education hours and have the option of completing advanced training that offers expanded education focused on an individual subject matter.

EMGs support demonstration gardens, school gardens, and community gardens where food is grown (Bennett 2022; Osafo 2021; Schneider et al. 2017). They also provide technical assistance to home gardeners. For individuals who grow produce for personal use, that produce is often ready within a short period of time, leaving the homeowner with more produce than can be consumed at one time. To avoid food waste, the excess produce can be given away, sold, or preserved.

To complement the education regarding home gardening, information and training regarding home food

preservation (FP) techniques have been provided for more than a century (US Department of Agriculture National and Agricultural Library 2023). In recent years, the interest in FP has been growing. Between March 2020 and 2022, The National Center for Home Food Preservation (University of Georgia 2023) reported a 620% increase in website access and a 270% increase in requests for validated recipes, suggesting a growing interest in home FP (Schwan 2023). This increase may reflect the COVID-19 pandemic; however, other factors that encourage individuals to preserve food at home include having more control over the ingredients in food, becoming self-sufficient, and saving money (Dye and Hoffman 2014).

In Texas, most home FP programs and workshops are conducted by County Extension Agents for Family and Community Health (formerly Family and Consumer Sciences) (Anding 2022). In other states, 4-H Agents and EMGs join Family and Consumer Sciences agents to lead FP outreach in their communities (Henley and Traunfeld 2021). Regardless of who is providing the information, it is critical to emphasize research-based practices and recipes to prevent spoilage and foodborne illnesses.

When EMGs are teaching the public about home gardening and food production practices, it seems logical to expect that the next step would be educating about home FP. However, most EMG programs do not include home FP as a part of their curriculum. Furthermore, little is known about what EMGs know about home FP and to what extent they participate in home FP workshops/activities at the local level. An online survey of 586 Maryland EMGs found that more than 65% were asked questions regarding FP at community events. Additionally, most of the EMGs included in the study (66%) were unaware whether FP workshops were offered by their local extension offices (Henley and Traunfeld 2021).

Previous studies have confirmed the use of unsafe home FP practices by consumers (Anding 2022; D'Sa et al. 2007). The extent to which EMGs are personally engaged in home FP activities is unclear, and little is known about the confidence level that EMGs have when approached with questions about FP. The present study assessed current FP practices among Texas EMGs, the

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<sup>1</sup>Department of Nutrition, Texas A&M AgriLife Extension Service, 119 Cater-Mattil, Texas A&M University, 2253, College Station, TX 77843-2253, USA

<sup>2</sup>Department of Horticultural Sciences, Texas A&M AgriLife Extension Service, 578 John Kimbrough Boulevard, Texas A&M University, 2144, College Station, TX 77843-2144, USA

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J.D.A. is the corresponding author. E-mail: j-anding@tamu.edu.

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frequency of FP questions for EMGs, the perceived confidence of EMGs when answering FP questions, and the interest of EMGs in learning more about FP to better serve their local constituents.

## Materials and methods

**SURVEY DEVELOPMENT.** The survey used for this study assessed the following four areas among Texas EMGs: current home FP practices, frequency of fielding questions about home FP, confidence when answering questions about specific home FP topics, and interest in learning about home FP. Questions related to current home FP practices were adapted from the National Center for Home Food Preservation National Canning and Preserving Survey (D'Sa et al. 2007) and reflected practices within the previous 12 months. Questions related to the frequency of answering questions about specific topics associated with home FP were adapted from Henley and Traunfeld (2021); confidence about and interest in learning specific home FP topics were assessed using a 5-point Likert scale. Demographic questions were also added and included the year of birth, county of residence, sex, race/ethnicity, and years of EMG experience. The survey was pilot-tested for clarity and ease among 10 EMGs before administration.

**SUBJECT RECRUITMENT AND SURVEY ADMINISTRATION.** All EMGs (11,245) who were registered in Texas at the time of the study were invited to participate in the survey that was administered in English via Qualtrics (Qualtrics, Provo, UT, USA). Invitations and links to the survey mirrored the procedures outlined in Dillman's Tailored Design Method (Dillman 1999) and were distributed during Spring 2023.

**STATISTICAL ANALYSIS.** Data analysis was conducted using SPSS (IBM SPSS Statistics version. 27; IBM Corp., Armonk, NY, USA) and primarily consisted of summary statistics. The study protocol was approved by the Institutional Review Board at Texas A&M University (IRB2022-1471M).

## Results

**PARTICIPANT CHARACTERISTICS.** EMGs (n = 1875) from 134 of the 254 counties in Texas participated in the survey (16% response rate). As shown in Table 1, the majority of participants were female (n = 1544;

**Table 1. Demographic characteristics of Extension Master Gardeners (EMGs) in Texas who responded to a survey about interest in home food preservation (n = 1875).**

Participant characteristics	Responses, no. (% of total) <sup>i</sup>
Sex	
Male	275 (14.7)
Female	1544 (82.3)
No response	56 (3.0)
Race/ethnicity	
African American (non-Hispanic)	49 (2.6)
Asian	23 (1.2)
Hispanic	96 (5.1)
Native American	11 (0.6)
White (non-Hispanic)	1478 (78.8)
Multiracial	36 (1.9)
Other	40 (2.1)
No response	142 (7.6)
EMG experience	
<1 year	457 (24.4)
1–5 years	680 (36.3)
6–10 years	351 (18.7)
11 to 15 years	189 (10.1)
16 years or longer	158 (8.4)
No response	40 (2.1)

<sup>i</sup> The percentage was rounded to the nearest tenth.

82%) and white (n = 1478; 79%), with an average age of 65 years (range, 19–92 years). Most (n = 1137; 60%) participants had been an EMGs for 5 years or less.

**FOOD PRESERVATION ACTIVITIES.** Of the 1875 EMGs, 1713 (91%) reported preserving food at home during the past 12 months by drying, freezing, or canning (Table 2). Among these EMGs, freezing was the most common method of home FP used (n = 1637; 96%), followed by using a boiling water bath canner to process tomatoes (*Solanum lycopersicum*) and fruits (n = 642; 38%), jams and jellies (n = 623; 36%), and pickles (n = 618; 36%). More than one-third of the EMGs (n = 616; 36%) had dehydrated foods. Pressure canning was used least often by the EMGs, with more than one-half reporting no experience with this method of FP.

Freezing, drying, boiling water bath canning, and pressure canning are safe methods of home FP when performed correctly. Some of the EMGs, however, reported using FP techniques that are considered unsafe by the US Department of Agriculture (US Department of Agriculture 2015). For example, 214 (13%) EMGs reported processing vegetables that were not pickled using a boiling water bath canner (Table 2). This is a concern because vegetables are a low-acid food and, as such, require processing in a pressure canner to prevent any botulism spores that may

be present from becoming active and producing a toxin that can cause serious illness or death. Some EMGs reported using the open-kettle method to process high-acid foods such as jams and jellies (n = 222; 13%), fruits and tomatoes (n = 178; 10%), pickles (n = 190; 11%), and salsa (n = 135; 8%). This method is an outdated process during which hot foods are placed into hot, sterilized jars. Lids and bands are applied, and the product is allowed to cool at room temperature. While the jars are cooling, a vacuum is formed that seals the jars, but the seal may not be strong enough to prevent the jar contents from becoming contaminated. Additionally, because there is no additional processing after the jars are filled, spoilage or pathogenic bacteria that may be present are not destroyed. Processing low-acid foods in a pressure cooker and oven canning was also reported by EMGs, but in much lower numbers.

**SOURCES OF HOME FOOD PRESERVATION INFORMATION AND RECIPES.** Of the 1713 EMGs who were engaged in home FP, 1076 (63%) reported canning food during the previous 12 months (using safe or unsafe methods). Among this group, the sources of information and recipes used most often are shown in Fig. 1. The *Ball Blue Book* (Altrista Consumer Products 2020) was the source used most often (n = 547; 51%), followed by family members and/or friends (n = 407; 38%) and

**Table 2. Self-reported home food preservation practices of Extension Master Gardeners in Texas within the past 12 months (n = 1713<sup>i</sup>).**

Practice	Used within the past 12 mo. Responses, no. (% of total) <sup>ii</sup>	Not used within past 12 mo. Responses, no. (% of total)	Have never used Responses, no. (% of total)
<b>SAFE METHODS</b>			
<b>Froze foods that were grown or bought</b>	1637 (95.6)	66 (3.9)	9 (0.5)
<b>Dehydrated foods</b>	616 (36.0)	824 (48.1)	2752 (15.9)
<b>Boiling water bath canning process</b>			
Fruits and tomatoes	642 (37.5)	658 (38.4)	396 (23.1)
Jams and jellies	623 (36.4)	663 (38.7)	382 (22.3)
Pickles/pickled vegetables	618 (36.1)	652 (38.1)	396 (23.1)
Salsa	411 (24.0)	763 (44.5)	497 (29.0)
<b>Pressure canning process</b>			
Fruits and tomatoes	151 (8.8)	681 (39.8)	865 (50.5)
Jams and jellies	68 (4.0)	717 (41.9)	889 (51.9)
Vegetables (not pickled)	163 (9.5)	650 (37.9)	856 (50.0)
Pickles/pickled vegetables	75 (4.4)	707 (41.3)	890 (52.0)
Meat, poultry, or seafood	99 (5.8)	601 (35.1)	944 (55.1)
Salsa	77 (4.5)	700 (40.9)	895 (52.2)
<b>Pressure cooker processing<sup>iii</sup></b>			
Fruits and tomatoes	83 (4.8)	737 (43.0)	879 (51.3)
Jams and jellies	50 (2.9)	728 (42.5)	897 (52.4)
Pickles/pickled vegetables	41 (2.4)	738 (43.1)	896 (52.3)
Salsa	38 (2.2)	727 (42.4)	907 (52.9)
<b>UNSAFE METHODS</b>			
<b>Boiling water bath canning</b>			
Vegetables (not pickled)	214 (12.5)	917 (53.5)	525 (30.6)
Meat, poultry, or seafood	41 (2.4)	817 (47.7)	789 (46.1)
<b>Open kettle method</b>			
Fruits and tomatoes	178 (10.4)	734 (42.8)	779 (45.5)
Jams and jellies	222 (13.0)	714 (41.7)	744 (43.4)
Pickles/pickled vegetables	190 (11.1)	706 (41.2)	778 (45.4)
Salsa	135 (7.9)	736 (43.0)	803 (46.9)
Vegetables (not pickled)	69 (4.0)	769 (44.9)	826 (48.2)
Meat, poultry, or seafood	17 (1.0)	682 (39.8)	1655 (96.6)
<b>Pressure cooker processing</b>			
Vegetables (not pickled)	60 (3.5)	722 (42.12)	888 (51.8)
Meat, poultry, or seafood	24 (1.4)	661 (38.6)	976 (57.0)
<b>Oven processing</b>			
Fruits and tomatoes	54 (3.2)	660 (38.5)	987 (57.6)
Jams and jellies	21 (1.2)	660 (38.5)	1002 (58.5)
Pickles/pickled vegetables	29 (1.7)	653 (38.1)	1000 (58.4)
Salsa	24 (1.4)	650 (37.9)	1008 (58.2)
Vegetables (not pickled)	25 (1.5)	647 (37.8)	1003 (58.6)
Meat, poultry, or seafood	17 (1.0)	609 (35.6)	1027 (60.0)

<sup>i</sup> Based on the 1713 Extension Master Gardeners who reported using at least one method of home food preservation.<sup>ii</sup> The percentage was rounded to the nearest tenth (standard deviation) and reflects only those who responded to that specific practice.<sup>iii</sup> The method is considered safe assuming that the boiling water bath canner is large enough for at least 1 inch (2.54 cm) of water to cover the tops of jars and is used only to process high-acid foods.

general cookbooks (n = 391; 36%). Sources promoted by extension professionals, including the US Department of Agriculture, extension publications and websites, and the National Center for Home Food Preservation website (University of Georgia 2023) were used less frequently. The majority (n = 702; 65.2%) of EMGs reported that they followed the instructions and recipes as

they were written, whereas 310 (28.8%) acknowledged adapting the recipes. Additionally, 83 (8%) reported adjusting the processing time because of altitude changes and 501 (57%) responded that no adjustments were needed. Seventy-three participants (7%) responded that they did not know the recommended adjustments for the altitude where they lived.

**FIELDING QUESTIONS ABOUT HOME FOOD PRESERVATION.** More than half (n = 1034; 55%) of all EMGs reported that they were asked questions about home FP (Fig. 2), although the highest percentage of responses were “sometimes” and “rarely.” When asked what areas of home FP that they were questioned about, the top responses were drying herbs (n = 502; 49%), freezing fruits

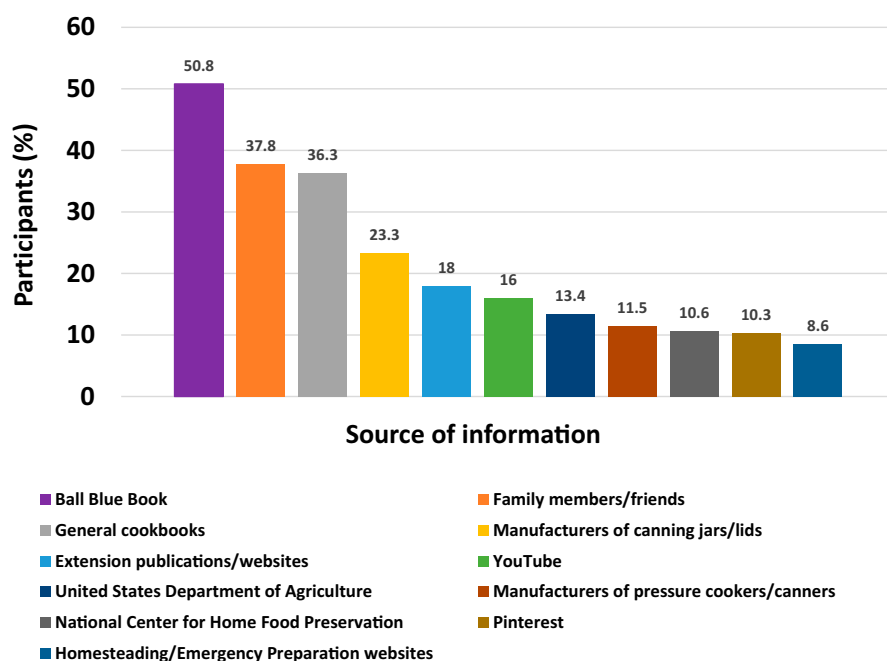


Fig. 1. Sources of home food preservation information and recipes used by 1713 Extension Master Gardeners in Texas who reported canning foods at home during the previous 12 months. *Ball Blue Book* (Altrista Consumer Products), National Center for Home Food Preservation (University of Georgia, Athens, GA, USA), YouTube (youtube.com; San Bruno, CA, USA), and Pinterest (pinterest.com; San Francisco, CA, USA).

and vegetables ( $n = 469$ ; 45%), preparing and preserving jams/jellies ( $n = 397$ ; 38%), and preparing and canning salsa and other tomato products ( $n = 375$ ; 36%). Approximately one out of four EMGs ( $n = 267$ ; 26%) were asked about safe and reliable FP methods.

**CONFIDENCE WHEN ANSWERING FOOD PRESERVATION QUESTIONS.** Confidence when answering questions about home FP varied by topic, with the lowest level of confidence reported for

drying meat and pressure canning low-acid foods (Table 3). Freezing fruits and vegetables, preparing and preserving jams/jellies, drying herbs, and sources of reliable recipes for home FP were topics that EMGs were more confident about answering. Still, except for freezing fruits and vegetables, the average responses were less than “somewhat confident.”

**INVOLVEMENT WITH LOCAL FOOD PRESERVATION PROGRAMS AND WORKSHOPS.** Only 367 (20%) EMGs reported that

FP workshops were offered by their local extension agents. Among those 367, 23 (6%) were assisting the agents who conducted the workshop. Of these 23 EMGs, their confidence in their ability to answer questions about home FP ranged from a low of  $2.35 \pm 1.5$  (mean  $\pm$  SD) for drying meat/jerky to a high of  $4.65 \pm 0.65$  for sources of information for home FP.

**INTEREST IN LEARNING ABOUT HOME FOOD PRESERVATION.** The extent to which all EMGs participants ( $n = 1875$ ) were interested in learning about home FP varied by topic and is shown in Table 4. Nearly all ( $n = 1799$ ; 96%) expressed interest in learning more about one or more of the topics suggested. Topics that EMGs were most interested in learning about were safe and reliable methods of home FP, drying herbs, freezing fruits and vegetables, preparing and canning salsa/tomato products, and sources of reliable recipes. Drying meat (jerky) and pressure canning were of least interest.

## Discussion

The percentage of EMGs who were asked questions about home FP was high, but it was lower than that previously reported (Henley and Traunfeld 2021). Knowledge of FP workshops and other educational activities conducted by extension personnel was also low compared with previous research. To our knowledge, the study published by Henley and Traunfeld (2021) is the only published study about EMG involvement in home FP. Our study involved a more holistic investigation and assessed not only current home FP practices but also involvement in county extension FP programs, their confidence in answering FP questions, and interest in learning more about home FP.

Our findings suggest that while many EMGs are engaged and interested in learning about various methods of home FP, their confidence in fielding questions may be less than desired. The percentage of EMGs who were practicing unsafe home FP practices was lower than that previously reported by Anding (2022) and D’Sa et al. (2007), but it could be a safety concern if these unsafe methods are shared with clients.

One limitation of our study was that it is possible that only EMGs who were interested in home FP chose to participate. Although most of the EMGs

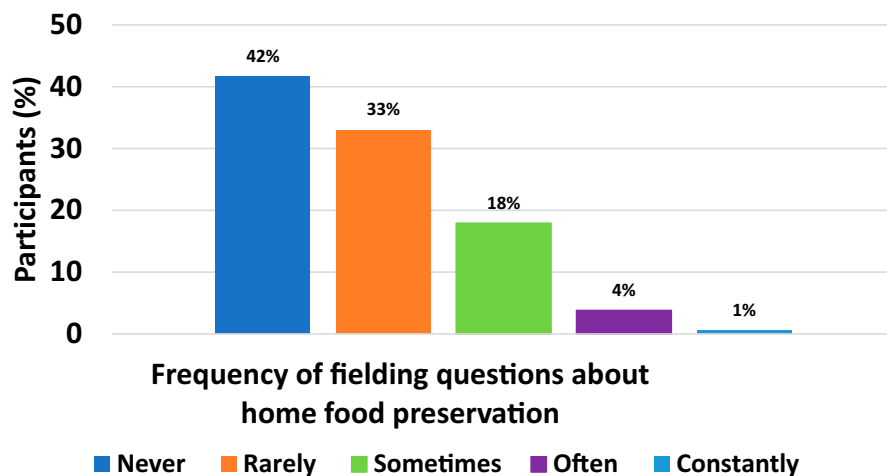


Fig. 2. Frequency of fielding questions about home food preservation reported by Extension Master Gardeners ( $n = 1875$ ) in Texas.

**Table 3. Extension Master Gardeners in Texas and their perceived confidence when answering questions about home food preservation (n = 1875).**

Topic area	Mean response $\pm$ SD <sup>i</sup>
Freezing fruits and vegetables	3.1 $\pm$ 1.3
Preparing and preserving jams and jellies	2.7 $\pm$ 1.5
Drying herbs	2.7 $\pm$ 1.4
Reliable recipes for home food preservation	2.6 $\pm$ 1.4
Preparing and canning salsa and other tomato products	2.5 $\pm$ 1.4
Safe and reliable methods for preserving food at home	2.5 $\pm$ 1.3
Preparing and canning fruit	2.3 $\pm$ 1.4
Drying fruits and vegetables	2.2 $\pm$ 1.3
Drying meat (jerky)	1.6 $\pm$ 1.1
Pressure canning low-acid foods (vegetables, meat, poultry, and seafood)	1.6 $\pm$ 1.1

<sup>i</sup> Mean response  $\pm$  SD based on a 5-point Likert scale, with 1 = not confident at all, 2 = slightly confident, 3 = somewhat confident, 4 = moderately confident, and 5 = very confident.

**Table 4. Extension Master Gardeners in Texas who reported interest in learning more about home food preservation (n = 1875).**

Topic area	Mean level of interest $\pm$ SD <sup>i</sup>
Safe and reliable methods for preserving foods at home	4.1 $\pm$ 1.2
Drying herbs	4.1 $\pm$ 1.2
Freezing fruits and vegetables	4.0 $\pm$ 1.2
Preparing and canning salsa and other tomato products	4.0 $\pm$ 1.3
Sources of reliable recipes for home food preservation	4.0 $\pm$ 1.3
Drying fruits and vegetables	3.9 $\pm$ 1.3
Preparing and canning fruit	3.9 $\pm$ 1.3
Preparing and preserving jams and jellies	3.8 $\pm$ 1.3
Pressure canning low-acid foods such as vegetables, meat, poultry, and seafood	3.4 $\pm$ 1.5
Drying meat (jerky)	3.2 (1.6)

<sup>i</sup> Mean  $\pm$  SD based on a 5-point Likert scale, with 1 = not very interested at all, 2 = not very interested, 3 = neutral, 4 = somewhat interested, and 5 = very interested.

reported freezing foods, fewer were canning or drying. Still, the interest shown by EMGs in learning more about home FP mirrors the trends in FP interest previously reported (Schwan 2023). Another limitation of our study was that our response rate (16%) was lower than desired. At the time of this study, Texas EMGs included both active and inactive volunteers. Except for the 40 EMGs who did not respond to the question, the length of time in the program reported by the EMGs suggested that nearly 98% of our participants were active at the time of the study. Therefore, it is possible that our response rate was higher than that reported. Since this study was conducted, the Texas EMG program has initiated a state-wide system to maintain a database of only those EMGs who are active. Caution should be used when generalizing our results to all EMGs across the United States.

In conclusion, the EMGs in our study expressed high interest in learning about safe home FP methods. Including information about the types of safe home FP methods and sources of research-based recipes and information in EMG training materials should be considered when training EMGs.

## References cited

- Anding J. 2022. An assessment of canning practices among food preservation workshop participants during COVID-19 in Texas. *J Hum Sci Ext.* 10(3). <https://doi.org/10.55533/2325-5226.1432>.
- Altrista Consumer Products. 2020. Ball blue book guide to preserving. Ball Corporation, Indianapolis, IN, USA.
- Bennett P. 2022. Addressing food insecurity utilizing master gardener volunteers in Ohio. In XXXI International Horticultural

Congress (IHC2022): International Symposium on Urban Horticulture for Sustainable Food 1356:59–64. [https://www.actahort.org/books/1356/1356\\_9.htm](https://www.actahort.org/books/1356/1356_9.htm). [accessed 28 Nov 2023].

Dillman DA. 1999. Mail and internet surveys: the tailored design method (2nd ed). John Wiley and Sons, Inc., Hoboken, NJ, USA.

D'Sa EM, Andress EL, Harrison JA, Harrison MA. 2007. Survey of home canning practices and safety issues in the U.S. Institute of Food Technologists Annual Meeting, Chicago, IL. [https://nchfp.uga.edu/papers/2007/canning\\_survey.html](https://nchfp.uga.edu/papers/2007/canning_survey.html). [accessed 28 Nov 2023].

Dye L, Hoffman K. 2014. 5 Steps to food preservation program meets the needs of Idaho families. *J Ext.* 52(2). <https://doi.org/10.34068/joe.52.02.12>.

Henley SC, Traunfeld J. 2021. Assessing master gardener volunteers' involvement in and knowledge of food preservation. *J Hum Sci Ext.* 9(1):84–93. <https://doi.org/10.54718/BZSB6810>.

Osafo E. 2021. Engaging communities in challenging times: Lessons learned from the master gardener program during the COVID-19 pandemic. *Adv Dev Hum Resour.* 23(1):75–87. <https://doi.org/10.1177/1523422320972142>.

Schwan C. 2023. Can you save money by preserving food at home? University of Georgia, College of Family and Consumer Sciences. <https://www.fcs.uga.edu/news/story/can-you-save-money-by-preserving-food-at-home>. [accessed 12 Sep 2023].

Schneider S, Pharr J, Bungum T. 2017. Impact of school garden participation on the health behaviors of children. *Health Behav Policy Rev.* 4(1):46–52. <https://doi.org/10.14485/HBPR.4.1.5>.

Texas Extension Master Gardener. 2022. Annual report. <https://txmg.org/archives/annual-reports>.

US Department of Agriculture. 2015. USDA complete guide to home canning. Agriculture information bulletin no. 539. [https://nchfp.uga.edu/publications/publications\\_usda.html](https://nchfp.uga.edu/publications/publications_usda.html).

US Department of Agriculture National Agricultural Library. 2023. How did we can? The evolution of home canning practices. <https://www.nal.usda.gov/exhibits/ipd/canning/timeline-table>. [accessed 20 Oct 2023].

University of Georgia, College of Family and Consumer Sciences. 2023. National Center for Home Food Preservation. <https://nchfp.uga.edu>. [accessed 20 Oct 2023].