

# PULSE CROPS

## CONSIDER THE PULSEABILITIES!

RECOMMENDED GRADE LEVELS	AVERAGE TIME TO COMPLETE <i>Time does not include optional items listed in the lesson plan.</i>	THANK YOU TO THE FOLLOWING EDUCATORS FOR DEVELOPING SPECIFIC COMPONENTS OF THIS LESSON PLAN.
9-12 grade	<b>Anticipatory Set &amp; Facilitation:</b> 90 minutes  <b>Conclusion/Assessment Options:</b> 90 minutes	<ul style="list-style-type: none"> <li>▪ Joanna Krogstad; F.C.S. Educator; Bozeman High School</li> <li>▪ Northern Plains Pulse Crop Producers</li> <li>▪ Northern Pulse Growers Association</li> <li>▪ Montana Department of Agriculture, Montana Agriculture in the Classroom Program</li> <li>▪ Family Economics and Financial Education, Active Learning Tool; News Interview</li> <li>▪ Pulse Bingo; Julie Garden-Robinson, Ph.D., L.R.D. Food and Nutrition Specialist &amp; Rebecca West, M.A., Program Assistant</li> </ul>
NATIONAL STANDARDS		LESSON PLAN OBJECTIVES
<b>National Family and Consumer Sciences Standards:</b> <ul style="list-style-type: none"> <li>▪ 14.1.4 Analyze the effects of global and local events and conditions on food choices and practices</li> <li>▪ 9.5.3 Prepare food for presentation and assessment</li> </ul> <b>Common Core Standards:</b> <ul style="list-style-type: none"> <li>▪ ELA WHST.9-10.9 Draw evidence from informational texts to support analysis, reflection, and research.</li> </ul>		<ul style="list-style-type: none"> <li>▪ Identify pulse crops</li> <li>▪ Investigate nutritional value in pulse crops</li> <li>▪ Uncover the benefits of pulse crops</li> <li>▪ Prepare foods made primarily from pulse crops</li> </ul>
<b>TEACHER NOTES...</b> <ul style="list-style-type: none"> <li>▪ Individual copies of <i>Cooking with Pulses Cookbook, recipes and tips for health and nutrition</i>, may be ordered for each student from Northern Pulse Growers Association, Burnt Boat Drive, Bismarck, ND, 58503 or by calling 701-222-0128. Allow plenty of time for delivery!</li> <li>▪ <i>Northern Plains Student Ag Mag</i> can be viewed on line at <a href="http://www.flipsnack.com/5D687897C6F/northern-plains-student-pulse-crop-ag-mag.html">http://www.flipsnack.com/5D687897C6F/northern-plains-student-pulse-crop-ag-mag.html</a> or ordered in bulk from Lorri Brenneman, Montana Department of Agriculture, Phone: (406)437-1906, E-mail: <a href="mailto:LBrenneman@mt.gov">LBrenneman@mt.gov</a></li> </ul>		
MATERIALS		
MATERIALS PROVIDED WITHIN THIS LESSON PLAN	RESOURCES AVAILABLE IN A SEPARATE DOWNLOAD AT ...	MATERIALS THAT MAY NEED TO BE ACQUIRED SEPARATELY
<ul style="list-style-type: none"> <li>▪ News Interview Guide worksheet (pgs. 5-6)</li> <li>▪ News Interview Rubric (pg. 7)</li> <li>▪ Research Articles Relating to Pulse Crops (pgs. 8-16)</li> <li>▪ Connections, Points, and Questions Worksheet (pg. 17)</li> <li>▪ Pulse Bingo Drawing Numbers (pg. 18)</li> <li>▪ Pulse Bingo Questions &amp; Answers (pgs. 19-22)</li> </ul>	<ul style="list-style-type: none"> <li>▪ <i>Northern Plains Student Ag Mag</i> <a href="http://www.flipsnack.com/5D687897C6F/northern-plains-student-pulse-crop-ag-mag.html">http://www.flipsnack.com/5D687897C6F/northern-plains-student-pulse-crop-ag-mag.html</a></li> <li>▪ Place Called Northarvest <a href="http://beaninstitute.com/place-called-midharvest/">http://beaninstitute.com/place-called-midharvest/</a></li> </ul>	<ul style="list-style-type: none"> <li>▪ Index cards</li> <li>▪ Fake microphones (optional)</li> <li>▪ Costumes (optional)</li> <li>▪ Cooking With Pulses Cookbook; Northern Pulse Growers Association, Burnt Boat Drive, Bismarck, ND, 58503</li> <li>▪ Dried Lentils (Bingo Markers)</li> </ul>

▪ Pulse Bingo Cards (pgs. 23-36)		
----------------------------------	--	--

## CONTENT

EDUCATOR MATERIALS	PARTICIPANT READING
<p><i>Content materials are provided to help educators gain a better understanding of background information for this lesson.</i></p> <ul style="list-style-type: none"> <li>▪ <a href="http://www.northernpulse.com/">http://www.northernpulse.com/</a></li> <li>▪ <a href="http://www.pea-lentil.com/">http://www.pea-lentil.com/</a></li> <li>▪ <a href="http://ndsu.edu/pubweb/pulse-info/">http://ndsu.edu/pubweb/pulse-info/</a></li> <li>▪ <a href="http://agr.mtgobb/agr/Programs/Commodities/PulseCrops/">http://agr.mtgobb/agr/Programs/Commodities/PulseCrops/</a></li> </ul>	<ul style="list-style-type: none"> <li>▪ Current research articles Included in lesson plan</li> <li>▪ <i>Northern Plains Student Ag Mag</i>, Pulse Crops</li> </ul>

### ANTICIPATORY SET

#### Place Called Northarvest (Option 1)

**Approximate time:** 11:16 for video and 10-15 minutes class discussion

1. <http://beaninstitute.com/place-called-midharvest/> Although this video is not specific to Montana it is very thorough in its overview of the pulse crop industry.
2. While students are watching the video ask them to keep a list of the occupations that are be associated with the production and harvesting of pulse crops.
3. Discuss the wide variety of occupations discovered by the students at the conclusion of the video.

#### News Interview (Option 2)

**Approximate time:** 45 minutes

1. Divide participants into groups of two.
2. Each group will need a current news article related to the topic being discussed.
  - a. Refer to the resources listed in this lesson for related **Current Research Articles**. Prepare one news article for every two participants, pgs. 8-16.
3. Explain to participants that they will create a dialogue in the form of a television news interview that summarizes their article to the remainder of the participants.
  - a. Instruct participants to assign one person to be the interviewer and the other to be the interviewee.
  - b. Assign a time limit for the interview. The length of the interview should be determined by the educator (approximately 2-3 minutes works well).
4. Pass out a **News Interview Guide** worksheet to each group.
  - a. The **News Interview Guide** worksheet will help participants plan their news interview.
  - b. \*Note to educator: Index cards could be provided to participants for them to summarize their dialogue and use during their interview.
5. When preparing for the interview, instruct participants to:
  - a. Introduce the title, source and author(s) of the article within their interview.
  - b. Always ask open-ended questions, which require more than a “yes” or “no” answer from the interviewee.
  - c. Be creative when developing their interviews.
    - i. Participants can create stage names and characters for their interview.
    - ii. Participants may use props or dress up.
    - iii. The interviewer can become the “news anchor.”
    - iv. The interviewee can take on different roles.
      1. The author of the article
      2. A supporter of the article
      3. A critic of the article
      4. A person evaluating the article

6. Pass out a **News Interview Rubric** to each group.
  - a. Discuss the **News Interview Rubric** as a class.
  - b. The News Interview Rubric will be given to the educator prior to each group's interview.
7. After each news interview, add any additional information regarding the article that was not covered in the interview, and allow time for participants to ask questions regarding the information presented.

\*Note to educator: As an alternative to this facilitation, participants can create a news anchor broadcast (rather than an interview) to report and summarize the given article or topic. Participants could work individually or in groups of two for this facilitation.

\*\*Note to educator: The News Interview activity could be facilitated using groups of three participants. Two of the group members would become interviewees on opposing sides of a topic and/or article. This would present the pros and cons of a topic and/or article in a debate format.

\*\*\*Note to educator: The News Interview activity could also be used as a review activity that summarizes key points of a lesson, video, or article.

#### RECOMMENDED FACILITATION

**Approximate time:** 45 minutes

1. Each student will receive a *Northern Plains Student Ag Mag*, *Pulse Crops* and the **Connections, Points, and Questions worksheet**.
2. Students will complete the first two columns of the chart ("Connections" and "Most Important Points") as they read the assignment.
3. In the "Connections" column, have students make entries from their reading that match something they already know. The entries might expand on their prior knowledge or be a new connection they have made with something they already knew.
4. As students encounter ideas in the reading that they think are important to remember or that summarize a main point, have them enter those in the "Most Important Points" column.
5. After students have completed the reading, have them frame questions about what they still don't understand or what they would like to know more about and enter those in column 3.

Tips/Variations:

**\*Rather than using the worksheet, use small stick-on notes throughout the reading to mark connections, most important points, and questions. Have students put an exclamation point (!) on some notes to indicate a connection, a star (\*) for most important points, and a question mark (?) for questions they have. Students should put the appropriate stick-on note directly on the text page.**

\*Use student questions to guide further classroom instruction, discussion, or study. Have the students select the questions for further study.

#### Conclusion

##### Cooking With Pulses

**Approximate time:** 90 minutes

1. Each student should receive a copy of, *cooking with pulses Cookbook, recipes and tips for health and nutrition*, to keep.
2. Break students into lab groups of 2-4.
3. Each group will choose and create a unique recipe from the cookbook to share with the entire class.
4. A class discussion will follow the tasting of each dish.

## ASSESSMENT

### Pulse Bingo

**Approximate time:** 45minutes

\*Note to teacher

#### Before the lesson ...

1. Photocopy and cut out numbers 1 to 24, (pg.18) and place them in a container. If you have limited time, you may want to preselect questions that you wish to emphasize.
2. Have small prizes available for the winners. (If you play to the end, everyone will have a “blackout” because the answers are on every card.)
3. Distribute one bingo card to each player. You may wish to laminate the cards so they last longer. (You can use erasable markers to mark the cards if laminated.) Distribute dry lentils, buttons, pieces of paper, etc., to players to mark their bingo cards.

#### Directions for playing Pulse Bingo

1. The instructor or designated leader should draw the numbers and ask the questions.
2. If you have limited time to play, you can choose the questions/answers you want to highlight ahead of time and include the numbers of those questions in the container. Or you can preselect the questions and read them in order.
3. Read the question and allow time for participants to find the answer.
4. The answers will be on the bingo cards. Give the players 10 seconds to figure out the answer before you tell them the answer. After you give them the answer, allow them time to mark it on their card. Reinforce the correct answer by providing some additional information.
5. A “bingo” occurs when a person gets five across, diagonally or down and calls out “Pulse!” The leader should check the card to make sure it’s a “bingo.” Continue to play until “blackout” if desired.
6. To “bingo” in a blackout game, the winner must have every space on his or her card filled.

# News Interview Guide

	Total Points Earned
	Total Points Possible
	Percentage

Name \_\_\_\_\_

Date \_\_\_\_\_

Class \_\_\_\_\_

Directions: Answer the following questions to evaluate the quality of the article.

1. What is the title of the article?
2. Can you find the author of the article? If so, who is the author of the article? What is that individual's background? What biases might the author have which would influence what they wrote? If you cannot find the author of the article, how many you determine if this is a valid source?
3. When was the article published?
4. Who published the article? Is the publisher a well-known, reputable source for information? Why or why not?
5. Who is the target audience for the article?
6. What do you believe is the purpose of the article?
7. List three of the main points of the article?
8. Is the article primarily comprised of fact or opinion? If the article includes facts, are the facts supported by other reputable resources? If opinion, how might a reader agree or disagree with the article and why?

**Directions: Utilize the answers to the questions above to create the dialogue for the news interview.**

9. What will be the purpose of your news interview? Purposes can include:

- a. To summarize and review the article
- b. To educate the audience
- c. To critique the article
- d. To analyze the article
- e. To discuss the pros and cons of an article

10. What stance will the interviewee take on the article? Possible stances can include:

- f. The author of the article
- g. A supporter of the article
- h. A critic of the article
- i. A person evaluating the article

11. Use the table below to brainstorm three discussion points for the interview. Remember that questions asked by the interviewer should be open-ended questions that require more than a “yes” or “no” answer.

<b>Topic</b>	<b>Interviewer- Questions to Ask</b>	<b>Interviewee- Responses to Give</b>	<b>Time Allotted for Topic</b>
1.			
2.			
3.			

12. Are all news interviews a reliable source of information?

## News Interview Rubric

**Directions:** Create a dialogue in the form of a television news interview that summarizes a news article.

1. Assign one group member to be the interviewer and the other to be the interviewee.
2. The length of the interview will vary and will be determined by the educator. My Time Limit: \_\_\_\_\_
3. Introduce the title and author(s) of the article within the interview.
4. The interviewer should always ask open-ended questions, which require more than a “yes” or “no” answer from the interviewee.
5. Be creative!

	Exemplary - 3	Satisfactory - 2	Unsatisfactory - 1	Rating	Weight	Score
<b>Group Participation</b>	Participants worked well together. There was clear communication between group members. All group members contributed to the preparation of the news interview.	Participants did not attempt to work well as a group. There was little communication between group members. At least one group member did not contribute to the preparation of the news interview.	Participants did not work well as a group. There was no communication between group members. Most group members did not contribute to the preparation of the news interview.		<b>3</b>	
<b>Content</b>	The news interview thoroughly summarized the article. During the interview, all main points of the article were discussed.	The news interview summarized the article. During the interview, most of the main points of the article were discussed.	The news interview did not summarize the article. During the interview, very few main points of the article were discussed.		<b>3</b>	
<b>Preparation and Creativity</b>	The interview reflected an exceptional degree of preparation and creativity from the participants.	The interview met the requirements of the assignment in terms of preparation and creativity.	The interview reflected a lack of preparation and creativity from the participants.		<b>3</b>	
<b>Followed Directions</b>	Participants followed all directions for the news interview.	Participants followed most of the directions for the news interview.	Participants did not follow directions for the news interview.		<b>2</b>	
				Total Points Earned		
				Total Points Available		
				Percentage		

## Current Research Articles

### Legumes are the most important dietary predictor of longevity

---

Many studies have shown that different peoples in various parts of the world have cuisines that enable them to live longer, such as in Mediterranean cuisines and in Japan. A recent study shows that certain foods are particularly protective against risk of death across cultures and ethnicities. The study, called Food Habits in Later Life, was conducted under guidance of the Union of Nutritional Sciences and the World Health Organization. It examined individual food groups (vegetables, legumes, fruits and nuts, cereals, dairy, meat, fish, alcohol, and monounsaturated/saturated fat ratios) as predictors of mortality among people aged 70 and over. The study was controlled for ethnicity, gender and smoking. Of all the food groups, legumes alone had consistent and statistically significant results.

Among the cultures studied were Japanese, Greeks, Anglo-Celtic Australians, and Swedes. The results showed that for every 20 grams increase in daily legumes intake there was an 8 percent reduction in the risk of death. That's less than an ounce increase per day of legumes ranging across cuisines from soy, tofu and miso in Japan, to brown beans and peas in Sweden, to lentils, chickpeas and white beans in the Mediterranean. There were variations among the different food groups across the different cultures with one exception: legumes. Legumes have for some time been connected with long-lived cultures, and this study shows that no matter what your ethnic background or where you live, eat more legumes to live longer, especially as you age.

Darmadi-Blackberry I, Wahlqvist ML, Kouris-Blazos A, Steen B, Lukito W, Horie Y, et al. Legumes: the most important dietary predictor of survival in older people of different ethnicities. *Asia Pacific J Clin Nutr* 2004;13(2):217-220.

### Study dispels myth of intolerable flatulence from eating pulses

---

Pulses have been studied extensively for their numerous health benefits. They are low in fat and high in fiber, attributes that have been shown to reduce the risk of chronic diseases such as diabetes and heart disease. Chickpeas, lentils, and green peas also are an inexpensive source of protein. Yet the consumption of these important pulses traditionally has been low in Western societies, due in part to the idea that they cause intolerable levels of flatulence and gastrointestinal (GI) upset. Researchers studied whether moderate consumption of pulses in healthy individuals causes digestive disturbances. A certain amount of gas is natural in helping the digestive system process pulses and helps them move through the GI tract, and regular consumption of pulses helps to build up a tolerance to flatulence.

Prior to this study, no other research had been done to assess whether gas and GI upset is really an issue when healthy individuals consume moderate amounts of pulses, so the authors conducted a randomized, double-blind, placebo-controlled cross-over study with 21 healthy males aged 19-40. They reported that flatulence and GI stress was not a significant factor in regular moderate pulse consumption, and that some difference was reported in the type of pulse eaten. In some cases flatulence was higher in different phases of digestion with different types of pulses. Overall, the findings show that regular moderate consumption of pulses does not increase flatulence to the point that you should avoid them—so soak those pulses, cook them thoroughly, and chew them well.

Veenstra JM, Duncan AM, Cryne CN, Deschambault BR, Boye JI, Benali M, et al. Effect of pulse consumption on perceived flatulence and gastrointestinal function in healthy males. *Food Res Int* 2010;43:553-559.



## **Ongoing research proves the power of peas**

---

In this recent review, the authors look at the demonstrated benefits of peas as well as the potential health benefits beyond their basic nutritional status. Bioactive proteins and peptides in peas have potential anticancer and immunomodulatory properties. The carbohydrate components of peas are a slowly digestible starch and relatively high fiber content, which make it a low-glycemic index food for prevention and management of type 2 diabetes. The fiber also contains a special family of sugars called oligosaccharides, or prebiotics, which promotes beneficial gut microbes. Vitamins and minerals in peas show concentrations of high potassium levels, as well as iron, magnesium, and manganese along with folate, an important B vitamin. Because of the phytate content in peas and legumes generally, the absorption of minerals can be limited, but with advanced food processing techniques these minerals can become more bioavailable.

Research to date has proved the power of peas to have a role in many health benefits in humans, including epidemiological, in vitro, and interventional studies. One of these benefits includes cardiovascular health in controlling blood pressure and cholesterol levels, particularly from the fiber content. Another benefit could improve weight management by satiety levels from the protein and fiber in peas, but more research needs to be done. Consumption of peas also benefits gastrointestinal function, again due to the fiber content but also the effects of prebiotics on the micro-flora environment in the gut. The phenolic compounds in peas also have shown beneficial antioxidant activity. We know peas have great nutritional value even though more research needs to be done to prove specific health benefits, but in the meantime we can strive to meet the federal daily guidelines.

Dahl WJ, Foster LM, Tyler RT. Review of the health benefits of peas (*Pisum sativum* L.). *Brit J Nutr* 2012;108:S3-S10.

## **The many health benefits of chickpeas and hummus**

---

Chickpeas are known by many names, including garbanzo beans, and have been an important food crop in India and more increasingly, the U.S. The nutrient profile of this important pulse crop includes a rich source of protein, fiber, vitamins and minerals. Chickpeas are also full of phytochemicals such as sterols, carotenoids, and isoflavones. This goes for canned chickpeas as well, although they must be rinsed well to avoid too much sodium. Because of these nutrients, the many health benefits of pulses, including chickpeas and the most common recipe made from them, hummus, are their role in reducing chronic diet related diseases: obesity, cardiovascular disease, and type 2 diabetes.

This study used data from the National Health and Nutrition Examination Survey taken during 2003-2010, focusing on information that showed the dietary intake of both chickpeas and hummus. Some of the researchers' findings revealed an overall better diet quality of chickpea/hummus consumers because they had lower intakes of added sugars, total fat, and cholesterol. Consumers also had lower body weight, waist circumference, and body mass index. People who ate chickpeas and hummus consumed more of other nutritional foods like whole fruit and vegetables and whole grains, suggesting that they "may have an overall healthier diet than nonconsumers." Another great benefit found was that the carbohydrate of chickpeas is very slowly digested, resulting in less of the starch being absorbed in the small intestine. Findings from this research show that health professionals and nutrition programs should encourage more consumption of pulse crops, including showing people how to make a great batch of hummus.

O'Neil CE, Nicklas TA, Fulgoni III VL. Chickpeas and hummus are associated with better nutrient intake, diet quality, and levels of some cardiovascular risk factors: National Health and Nutrition Examination Survey 2003-2010. *J Nutr Food Sci* 2014;4(1).

## Getting pulses into our food system

---

Beans, pulses, legumes—which word do we use? The authors begin this review article with a refresher in definitions of how these foods are all related. First, “legumes” is the all-encompassing word for dry fruit and pods containing dry seeds that fix nitrogen into the soil. Generally, legumes can be split into two categories, pulses and another category that includes soybeans, peanuts, green beans, and green peas. The pulse category can be further broken down into two types: dry beans, and another type that includes chickpeas, dry peas, and lentils. The distinction is made between these two types because chickpeas, dry peas, and lentils have different growing conditions, growth structure, and maturation than that of the dry bean type. Commonly, then, these three crops are collectively referred to as pulses, while dry beans, although technically pulses, are in their own category of edible bean crops.

Because pulse crops are so nutritious, inexpensive, and gluten-free, some of the ways they can be added to our food system are being researched continually. Chickpeas are high in protein, available carbohydrate, and crude fiber contents, and low in fat. They supply thiamin, niacin, calcium, phosphorus, iron, magnesium, and potassium. Extruded chickpeas could expand snack products offerings currently using corn, the advantage being higher protein content and nutritional quality. Lentils and dry peas also have a similar nutritional profile as chickpeas. Lentils can be ground to a flour to make lentil cakes or a coating for vegetables, and dry pea flour can be mixed with wheat flour to produce new products for baking and frying. These value-added products “represent good alternatives to traditional cereal-based snacks” and “would increase pulse consumption.”

Asif M, Rooney LW, Ali R, Riaz MN. Application and opportunities of pulses in food system: a review. *Crit Rev Food Sci Nutr* 2013;53:1168-1179.

## Lentils’ role in reducing blood pressure and remodeling arteries

---

Because cardiovascular disease is the leading cause of death in the world, current research aims to find solutions to alleviate its risk factors. One such risk factor is high blood pressure. Dietary approaches make sense in prevention and mitigation of hypertension, including the popular DASH (Dietary Approaches to Stop Hypertension) diet. Increasing vegetable intake is an important part of a healthy diet, especially in view that some research shows many of us do not even come near to consuming the recommended daily amounts suggested by the FDA. Pulse crops are an important part of vegetable intake, and this study aims to single out different properties of pulse crops and their health benefits, specifically lentils.

In this study, lentils above all the other pulses were found to attenuate a rise in blood pressure in spontaneously hypertensive rats. Further, it also found a lentil-based diet to be able to attenuate aortic remodeling. Past studies have shown that all pulses are able to decrease levels of circulating cholesterol, but this is the first one that focuses on a specific pulse, lentils, in its ability to “affect the pathways involved in vascular remodeling and hypertension.” More studies are called for to determine the exact mechanisms involved in these results, but in the meantime, dig out Grandma’s lentil soup recipe and start cooking.

Hanson MG, Zahradka P, Taylor CG. Lentil-based diets attenuate hypertension and large-artery remodeling in spontaneously hypertensive rats. *Br J Nutr* 2014;111:690-698.

## **Diabetes and pulses: a current review**

---

Because type 2 diabetes is an increasingly prevalent world health problem, especially for its role in cardiovascular disease and death, there is an increased need for effective disease management. One of the most important and effective ways to prevent and manage chronic disease is dietary change. Research into plant food materials, especially those of cost-effective and highly nutritive pulse crops, is important to show how they can be used in creating better health. Pulse crops especially have many antidiabetic properties. The chickpea features in a number of studies with animal models that show its hypoglycemic and subsequent action on cholesterol levels. Lentils have been researched using a few human studies where comparisons were made on blood glucose levels with a diet of lentils and canola oil against one of bread and cheese. Total cholesterol and fasting blood glucose were lower in the lentil protocol. Dry peas were also reviewed for their anticholesterolemic and antihyperglycemic actions in both human and animal studies, showing similar effects as the other pulses. Because type 2 diabetes is considered a lifestyle disease, improvement in dietary intake that includes pulses is important in reducing the enormous costs they inflict. “Dietary intervention with a diet rich in legumes seems to be a natural, cost-effective, and free from side effects solution for the prevention and treatment of [type 2 diabetes].”

Singhal P, Kaushik G, Mathur P. Antidiabetic potential of commonly consumed legumes: a review. *Crit Rev Food Sci Nutr* 2014;54(5):655-672.

## **Eating pulses helps reduce appetite in the “second-meal effect”**

---

Among pulses’ many nutritive properties are their high complex carbohydrate content, including soluble and insoluble fiber, and slowly digestible and resistant starches. These properties contribute to their low glycemic index, and can have an effect on blood glucose even after later meals, termed the “second-meal effect.” The authors studied pulses in order to show the role they play in reducing blood glucose after later meals, which also means a reduction in appetite, implicating their importance in weight loss through blood glucose control.

Healthy men ages 18-35 were recruited to participate in the study which included consumption of chickpeas, lentils, navy beans, yellow peas, and white bread, all served with tomato sauce. They had to fast 10-12 hours the night before and were given one of the five foods for breakfast, with blood glucose measurements taken at various intervals. After a couple of hours, the test subjects were given pizza and water with further blood glucose measurements. Although all pulses were better at lowering postprandial glycaemia compared with white bread, chickpeas and lentils were more effective in reducing appetite in the “second-meal effect” in measurements taken one hour after the pizza meal. Of course, a great way to have your pizza and eat it, too is to include chickpeas and lentils on the pizza.

Mollard RC, Wong CL, Luhovyy BL, Cho F, Anderson GH. Second-meal effects of pulses on blood glucose and subjective appetite following a standardized meal 2 h later. *Appl Physiol Nutr Metab* 2014;39:849-851.

## **Pulses save the day for gluten-free snacks**

---

Humans have relied on snack crackers since historic times when people were on the move for one reason or another. This travelling food has low moisture content and essentially no leavening which makes it handy for nourishment and requires little processing time. Crackers are usually made from grain products, but the market is wide open for the potential of introducing pulse based cracker products because of their high nutritional content and their gluten-free quality. This study evaluates the potential of pulse food fractions and flours to be used on a wide scale in manufacturing gluten-free friendly snack products.

After various pulse cracker products were developed, they were tested by consumers and generally found to be acceptable in shape and texture. There was, however, a tendency for the crackers to be too salty. Other spices or a different formulation could be used to cut down on sodium content, as this is an issue in the chickpea product in order to compensate for its strong flavor. The nutritional profile was also developed for a prototype food label, and found that these crackers have a higher iron content than grain based products. All in all, the potential market for pulse crackers and other snack products is excellent, and with the nutritional benefits provided by pulses, we can snack in good conscience.

Han J, Janz JAM, Gerlat M. Development of gluten-free cracker snacks using pulse flours and fractions. *Food Res Int* 2010;43:627-633.

## **The role of health organizations in promoting pulse consumption**

---

We all know that eating pulses is good for our better health, but how do we get that message? It is the role of health organizations to advise the best nutritional path in order to prevent and alleviate chronic disease. Vegetarianism is one such path where organizations such as the Vegetarian Society UK and the Vegetarian Resource Group “promote vegetarianism as a good option for remaining healthy and avoiding metabolic diseases.” They usually refer to the American Dietetic Association in learning how to approach a meat-free diet that relies on pulse foods, grains, fruits and vegetables and nuts and seeds. Other organizations involved with cancer, diabetes, heart disease, and obesity also promote plant based diets that utilize pulses in order to provide protein and other nutrients as well as fiber for good nutrition and a feeling of satiety.

In the past, most groups would point to the dangers of eating diets high in saturated fat and added sugars. Now, the tack is to promote the healthiest foods, including a diet rich in pulses, instead of emphasizing what to avoid. Usually when we strive to include the whole plant foods we need for total nutrition we end up avoiding those that are detrimental to our health. “Pulses are seen as a staple food because they are nutritious and provide most of the ingredients that help to improve health...this could encourage more consumers who are concerned about their health to consider eating pulses more frequently.”

Leterme P. Recommendations by health organizations for pulse consumption. *Br J Nutr* 2002;88(S3):S239-S242.

## **Split pea pasta**

---

Because pulses are so rich in vitamins, minerals, and other phytochemicals, their introduction into pasta products can increase nutritional value of these foods. They add more protein, fiber, B vitamins and minerals as well as amino acids lysine and threonin. The implications for pasta processing are to find a way to incorporate legume flour for ease of manufacturing. Water needs to be reduced and mixing speeds need to increase in order to process legumes into pasta. Split peas and fava beans were used in this study because these are legumes that are not usually used in processing. Fortifying pasta with legume flour resulted in a higher hardness and elasticity but also had a higher fracturability. Further work needs to be done in order to better incorporate legume flours into pasta “at an industrial scale in order to produce easily fortified pasta products while controlling the sensorial and nutritional quality of the final product.”

Petitot M, Boyer L, Minier C, Micard V. Fortification of pasta with split pea and faba bean flours: pasta processing and quality evaluation. *Food Res Int* 2010;43:634-641.

## **How cooking affects nutritional factors of pulses**

---

Pulses have many nutritional components, but they also contain a number of anti-nutritional constituents: trypsin inhibitors, phytic acid, tannins, and oligosaccharides. Trypsin inhibitors are a type of protein that inhibits the digestive enzyme trypsin. Phytic acid reduces mineral bioavailability. Tannins can form with other proteins to decrease the digestibility of protein and lower the availability of amino acids. Oligosaccharides are responsible for gas formation and flatulence. Researchers sought to find out how cooking affects these antinutritional properties as well as the beneficial nutrients in beans and chickpeas. Protein, starch, fat, and fiber all were increased significantly by cooking, while reducing tannins and oligosaccharides. Oligosaccharides are especially reduced during soaking time, so plan ahead and put some chickpeas in water before going to bed.

Wang N, Hatcher DW, Tyler RT, Toews R, Gawalko EJ. Effect of cooking on the composition of beans (*Phaseolus vulgaris* L.) and chickpeas (*Cicer arietinum* L.). *Food Res Int* 2010;43:589-594.

## **Complete nutritional support from both grains and pulses**

---

Another recent review looks at the nutritional and health benefits of both beans and grains, and how they complement one another. Nutritional components of whole grains include complex carbohydrates offering dietary fiber, starch, and oligosaccharides. Whole grains also offer a low-fat source of protein as well as vitamins and minerals, including vitamin E and magnesium. A recent study referring to whole grain consumption with its content of phytic acid may play a role in dental health. Whole grains also give us carotenoids and lignins. Pulses offer high amounts of fiber (much higher than whole grains), carbohydrates including starch-resistant, and oligosaccharides. They are higher in protein, and as some of the amino acids differ between whole grains and pulses they complement each other when consumed. Another study shows that the glycemic impact of eating refined grains can be mitigated by combining it with beans, as in a meal containing white rice and red beans, or hummus and bread.

Since consumption of these nutrient dense foods falls way below the recommended amounts, ways to increase intake are important. One of the reasons whole grain consumption is lower is because “consumers are confused as to what constitutes a whole-grain product.” For example, a product that states that it contains whole grains but is not listed as the first ingredient can have anywhere between one to 49 percent whole grains. Other reasons why there are issues with consumers getting adequate intake of grains and pulses are that they can be associated with lower socio-economic status, can have a bland taste, can have a tendency to produce flatulence, or a lack of knowledge in their preparation. “Nevertheless, there is a need to establish more convenient delivery systems for pulses in familiar food forms to lower the energy density of these foods and provide health benefits.”

Rebello CJ, Greenway FL, Finley JW. Whole grains and pulses: a comparison of the nutritional and health benefits. *J Agr Food Chem* 2014;62:7029-7049.

## **Can pulses increase satiety for weight loss success?**

---

This review says that it may, but more studies need to be done with obese human subjects. Because about 80 percent of weight loss interventions fail, many due to hunger and food cravings, pulses can be an important area of research because of their role in satiety. Pulses are high in protein and fiber, two important components in glycemic control linked to appetite reduction. The researchers were interested in the consumption of whole pulse foods, not their specific isolates, in determining levels of appetite satiety in aiding weight loss.

Some of the results of this review were very positive, showing analysis that there was a 31 percent increase in satiety after subjects consumed pulses compared to controls. However, the second meal effects of studies they reviewed did not show any significance, so that area of research needs more attention. Overall, the researchers state the need for more high quality long-term trials in order to “strengthen the emerging evidence for the relationship between dietary pulses, satiety, and weight management.”

Li SS, Kendall CWC, de Souza RJ, Jayalath VH, Cozma AI, Ha V, et al. Dietary pulses, satiety and food intake: a systematic review and meta-analysis of acute feeding trials. *Obesity* 2014;22:1773-1780.

## **Current review of pulses' benefits**

---

Pulses have been in use as human food for at least 10,000 years, and have current applications for animal feed and biofuel as well, with economic impact second only to cereal grain crops. This review examines five areas of importance in human pulse consumption. The nutritional composition of pulses includes a high carbohydrate content with slow digestibility of starches, high fiber content, a good source of mono- and polyunsaturated fat, plant sterols, and micronutrients, including selenium, thiamine, niacin, folate, riboflavin, pyridoxine (B6), vitamins E and A, iron, and zinc. The protein content is high in lysine, but low in methionine and tryptophan, which cereal grains provide, so the combination of the two provides an optimal amino acid profile. Many dietary approaches emphasize the inclusion of daily servings of pulses for greatest health benefits from the USDA Health and Human Services recommendations, to the DASH [Dietary Approaches to Stop Hypertension] diet for hypertension relief, as well as the Mediterranean diet, gluten-free diet, and vegetarian diet. Pulse consumption's effect on nutrient intake is substantial, with studies showing enhanced micronutrient intake for the above mentioned nutrients when pulses are included in the daily diet. Sodium intake was also higher, however, because of the use of canned beans, which can be mitigated by draining and rinsing the beans and making your own chili and soup instead of buying prepared products.

Many studies have also shown pulses' benefits on various cancers, mostly colorectal, prostate, breast, lung, esophageal and stomach cancers because of their fiber, micronutrient, and antinutrient content. Pulses also benefit and prevent cardiovascular disease because of their action on blood pressure, platelet activity, lipid profiles, and inflammation. The resistant starch in pulse products is helpful with diabetes, weight management, HIV, and aging and stress. We should all include consuming pulses and other bean products in our daily menus for increased health and chronic disease prevention and management.

Mudryj AN, Yu N, Aukema HM. Nutritional and health benefits of pulses. *Appl Physiol Nutr Metab* 2014;39:1-8. [dx.doi.org/10.1139/apnm-2013-0557](https://doi.org/10.1139/apnm-2013-0557).

## **ACE-inhibitors might be extracted from pulses in the future**

---

One of the main risks of cardiovascular disease is hypertension, which is commonly treated with [angiotensin converting enzyme-] ACE-inhibitor drugs. Because these drugs may have unpleasant side effects such as coughing, taste alteration, and skin rashes, many research studies aim to find a food derived alternative from ACE-inhibitory peptides. These could then be introduced into functional foods or produced as dietary supplements. Active peptides have already been obtained from milk proteins, and a few from plant seeds. This study looks at legumes such as lupins, chickpeas, lentils, and peas, among others.

The most promising results of obtaining protein hydrolysates from pulses were found with lupin trials. However, this work has shown that "some plant proteins may become a valuable source of ACE-inhibitory peptides, which in the future may be used for the formulation of functional foods or dietary supplements for the prevention or treatment of hypertension." Studies like these can reveal the potential of using protein isolates from pulses in the application of natural dietary supplementation, helping to avoid the unpleasant side effects of some prescription medications.

Boschin G, Scigliuolo GM, Resta D, Arnoldi A. ACE-inhibitory activity of enzymatic protein hydrolysates from lupin and other legumes. *Food Chem* 2014;145:34-40.

## **Anti-nutritional properties of pulses—the bad and the good**

---

As most know, pulses have a multitude of nutritional benefits including protein, vitamins, minerals, and fiber. But many are not familiar with the many anti-nutritional properties of pulses, some of which are the reasons we soak them and cook them for longer periods of time than other dry foods such as whole grains. Pulses evolved anti-nutritional properties in order to prevent consumption from predators during adverse conditions. These properties are referred to as anti-nutritional compounds (ANCs) and categorized as protein and nonprotein ANCs. Non-protein ANCs are relatively harmless and include alkaloids, phytic acid, saponins and other phenolic compounds. Protein ANCs have a range of potentially harmful components and are commonly represented by lectins, agglutinins, trypsin inhibitors, chymotrypsin inhibitors, and anti-fungal peptides.

Some studies have shown that “certain protein ANCs may have beneficial effects on human health after adequate processing procedures.” The present review focuses on three ANCs that have potential health benefits: lectins, protease inhibitors, and ACE [angiotensin converting enzyme] inhibiting peptides. ANCs are named thus because if pulses and other legumes and their flours are consumed raw, they can harm human health by gastrointestinal upset and blood coagulation. But when cooked, these factors are reduced. However, scientists are looking towards the nutraceutical applications of ANCs such as cancer prevention, immune enhancement, anti-inflammatories, hypertension treatment with ACE inhibitor factors, and antioxidant activity. Considering the potential health benefits of ANCs, the authors suggest that perhaps ‘antinutritional’ is a misnomer. At any rate, raw food movement or no, remember to soak and cook well your pulses and other legumes for best health.

Roy F, Boye JI, Simpson BK. Bioactive proteins and peptides in pulse crops: pea, chickpea and lentil. *Food Res Int* 2010;43:432-442.

## **Recent review of pulse intake and cardiovascular risk reduction**

---

One of the greatest risks for cardiovascular disease is abnormal concentrations of blood lipids, or high cholesterol levels. Pharmaceutical intervention has had an impact; however, “major health organizations have maintained that the initial and essential approach to the prevention and management of cardiovascular disease is to modify dietary and lifestyle patterns.” This review of recent studies aims to add to the body of research to show evidence for dietary guidelines that emphasize pulses in the diet for better health and decreased risk of cardiovascular health problems.

Some studies used pulse flours, some the whole food pulses, and the remainder used a combination. There were some gastrointestinal symptoms, such as upset stomach, flatulence, bloating, diarrhea and constipation, and increased stool frequency. Most of the studies showed that these temporary discomforts were improved with continued intake of pulses. Together, these studies suggest that there is a reduction in LDL cholesterol with about a serving (½ cup) a day intake. This could be a challenge for some populations such as the United States where the median intake is 0.2 servings a day. But with all the health benefits, including effects on other cardiometabolic risk factors such as body weight, blood pressure, and glucose control, we should make more of an effort to include pulses in our diet every day.

Ha V, Sievenpiper JL, de Souza RJ, Jayalath VH, Mirrahimi A, Agarwal A, et al. Effect of dietary pulse intake on established therapeutic lipid targets for cardiovascular risk reduction: a systematic review and meta-analysis of randomized controlled trials. *Can Med Assoc J* 2014;186(8):E252-E262.



# Connections, Points, and Questions Worksheet

TOPIC: Pulse Crops

!!!!!!!!!!!!!!!!!!!!!!!!!!!!! CONNECTIONS This matches something I already knew?	***** MOST IMPORTANT POINTS These are the main ideas of the reading.	?????????????????????? QUESTIONS I HAVE I'm still not sure I understand this, or I need more information.

## Pulse Bingo Drawing Numbers

<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>
<b>5</b>	<b>6</b>	<b>7</b>	<b>8</b>
<b>9</b>	<b>10</b>	<b>11</b>	<b>12</b>
<b>13</b>	<b>14</b>	<b>15</b>	<b>16</b>
<b>17</b>	<b>18</b>	<b>19</b>	<b>20</b>
<b>21</b>	<b>22</b>	<b>23</b>	<b>24</b>

# Pulse Bingo Questions and Answers

1. What B vitamin is in pulse foods naturally?

**Folate**

*Comment: Folate is found in pulse foods naturally. "Folic acid" is the man-made form of folate found in fortified cereals, flour and other grain-based foods. Folic acid helps prevent birth defects.*

2. What is another name for chickpeas?

**Garbanzo beans**

*Comment: "Garbanzo" is a term used mostly in Latin America and Spain.*

3. What pulse food usually is yellow or green?

**Dry peas**

*Comment: Split peas are used to make a delicious soup. Make your own soup at home to control the sodium content. Freeze leftovers in 1-cup portions for a quick and filling lunch.*

4. What pulse food can be brown, green, yellow, red, black or French green? **Lentils**

*Comment: Brown or green are the most common colors associated with lentils. French green and black are smaller and used as an interesting culinary alternative. Yellow and red are used mostly in Indian cooking and are called "dal." The yellow and red lentils have been dehulled and the color is from the cotyledon, or the inside of the seed.*

5. When you add fiber-rich foods such as chickpeas and lentils to your diet, what should you do? **Drink more liquids**

*Comment: Drinking plenty of water and other liquids with fiber-rich foods helps with digestion and prevents constipation.*

6. In what two food groups can pulses be found?

**Vegetable and Protein**

*Comment: If you are using pulses for your Vegetable Group recommendation, 1 cup of cooked pulses equals 1 cup of vegetables. If you are using pulses as part of your Protein Foods Group recommendations, ¼ cup of cooked pulses equals 1 ounce equivalent of protein. For example, 1 cup of split pea or lentil soup counts as a 2-ounce protein equivalent (allowing for water and other vegetables in the soup)*

7. In what forms can you buy many pulse foods?

**Canned and dry**

*Comment: Look for various pulse foods the next time you are in the grocery store. You might find ready-to-eat hummus in the deli area. Remember that many canned legumes have added sodium. For example, to reduce sodium in canned chickpeas, drain and rinse them.*

8. What food component in pulses is linked to reducing blood cholesterol levels and promoting a healthy weight? **Fiber**

*Comment: Soluble fiber has been shown in some studies to help reduce blood cholesterol levels as part of a healthy diet, and fiber contributes to weight management because it helps people feel full, or satiated.*

9. Which ingredient can toughen pulses if added too soon in the cooking process? **Salt**

*Comment: Add salt during the last 10 minutes of cooking time.*

**10. Which essential amino acid or protein building block is found in abundance in pulses? **Lysine****

*Comment: An essential amino acid means your body cannot produce it on its own, so you must get it from your diet. Lysine helps calcium absorption, helps build muscle and has anti-inflammatory properties, along with other health benefits.*

**11. To which of the following dishes can you add lentils to extend meat and for variety: taco meat, meatloaf or spaghetti sauce? **All three****

*Comment: Adding pulse foods to recipes such as taco meat stretches your meat budget & adds fiber.*

**12. What is the most popular recipe for using chickpeas? **Hummus****

*Optional comment: Have you tried hummus? Many different recipes are available. Today, we will try hummus as a snack.*

**13. What two important nutrients are in split pea soup? **Potassium and Vitamin K****

*Comment: Potassium is important for the functioning of the heart, kidneys and other organs. Vitamin K is needed for our blood to clot properly.*

**14. Vegetarians usually use pulses to get enough of this nutrient in their diet. Name the nutrient. **Protein****

*Comment: Although people commonly combine legumes with grains to get a “complete” protein, you can consume these separately as long as you do it within a 24-hour period.*

**15. Chickpeas and whole dry peas need this step before cooking, while lentils and split peas do not. What step is it? **Soaking****

*Comment: Overnight soaking is the easiest, but you also can use the quick-soak method.*

**22. Which element is produced by pulses as they**

**16. According to Italian folklore, what ailment could be “cured” by chickpeas? **Warts****

*Comment: This piece of folklore hasn’t stood the test of time, but it is interesting. Be sure to see your qualified health-care practitioner for advice about skin conditions.*

**17. In the 18<sup>th</sup> century, Germans substituted roasted chickpeas to make a popular beverage. What was it? **Coffee****

*Comment: Many coffee substitutes today use a variety of roasted grains and vegetables, including barley, chicory, dandelion root and carob.*

**18. Chickpeas, lentils and dry peas all can be ground to make what ingredient? **Flour****

*Comment: Pulse-based flours have become very important in gluten-free cooking and baking.*

**19. What is the overall name given to lentils, chickpeas and split peas? **Pulse Crops****

*Comment: The word “pulse” comes from the Anglo-French word “puuiz,” which means gruel or thick soup. That’s because pulse foods often are used to make these recipes.*

**20. Which type of diet can incorporate pulses to help with blood glucose management? **Diabetic Diet****

*Comment: Some studies show that consuming pulses many result in more stable blood glucose levels after meals.*

**21. On average, what amount of protein is in 1 c. of cooked pulses? **15 grams****

*Comment: That’s about one-third of our daily protein needs, based on a 2,000-calorie diet.*

**grow, making them as important agricultural crop?**

**Nitrogen**


*Comment: All legumes are “nitrogen fixing” plants because of the underground nodules growing from them. After harvest, the fixed nitrogen is released into the soil from the dead plant nodules, making it available for other crops, so it is a natural form of fertilizer.*


**23. What is another definition for the word pulse, which reminds us they are good for cardiovascular health? **Heartbeat****


*Comment: From FreeDictionary.com, a heartbeat is “the rhythmical throbbing of arteries produced by the regular contractions of the heart.”*


**24. What two states consistently are the top pulse growers in the U.S.? **Montana and North Dakota****


*Source: Farm and Ranch Guide, April 23, 2014*


<b>P</b>	<b>U</b>	<b>L</b>	<b>S</b>	<b>E</b>
North Dakota & Montana	Canned & Dry	Potassium & Vitamin K	Hummus	Heartbeat
Fiber	Flour	Garbanzo Beans	Salt	Protein
Vegetable & Protein	Diabetic Diet	 Free Space	Folate	Dry Peas
Lysine	Drink More Liquids	All Three	Coffee	Nitrogen
Warts	Lentils	15 Grams	Soaking	Pulse Crops

<b>P</b>	<b>U</b>	<b>L</b>	<b>S</b>	<b>E</b>
All Three	Potassium & Vitamin K	Pulse Crops	Lentils	Drink More Liquids
Canned & Dry	Heartbeat	Salt	Soaking	Protein
North Dakota & Montana	Coffee	 Free Space	Nitrogen	15 Grams
Flour	Hummus	Fiber	Diabetic Diet	Vegetables & Protein
Folate	Warts	Garbanzo Beans	Lysine	Dry Peas


<b>P</b>	<b>U</b>	<b>L</b>	<b>S</b>	<b>E</b>
Lentils	Soaking	Canned & Dry	North Dakota & Montana	Warts
Nitrogen	Pulse Crops	15 Grams	Vegetable & Protein	Drink More Liquids
Potassium & Vitamin K	Hummus	 Free Space	Salt	Protein
Dry Peas	Garbanzo Beans	All Three	Heartbeat	Lysine
Diabetic Diet	Folate	Fiber	Flour	Coffee


<b>P</b>	<b>U</b>	<b>L</b>	<b>S</b>	<b>E</b>
Vegetable & Protein	Soaking	Salt	Flour	All Three
Potassium & Vitamin K	Diabetic Diet	Pulse Crops	Warts	Heartbeat
Dry Peas	Hummus	 Free space	Nitrogen	Lentils
Canned & Dry	North Dakota & Montana	Coffee	Fiber	Garbanzo Beans
Lysine	Protein	Drink More Liquids	15 Grams	Folate


<b>P</b>	<b>U</b>	<b>L</b>	<b>S</b>	<b>E</b>
Folate	Coffee	Drink More Liquids	Hummus	Nitrogen
Lysine	Fiber	15 Grams	Lentils	Canned & Dry
Vegetable & Protein	Heartbeat	 Free Space	All Three	Potassium & Vitamin K
Warts	Garbanzo Beans	Salt	Dry Peas	Soaking
Pulse Crops	Flour	North Dakota & Montana	Protein	Diabetic Diet


<b>P</b>	<b>U</b>	<b>L</b>	<b>S</b>	<b>E</b>
North Dakota & Montana	Garbanzo Beans	Canned & Dry	Heartbeat	Soaking
Protein	Drink More Liquids	Coffee	Folate	Salt
Warts	Potassium & Vitamin K	 Free Space	Pulse Crops	Fiber
Diabetic Diet	Lentils	All Three	Lysine	Nitrogen
15 Grams	Dry Peas	Hummus	Flour	Vegetable & Protein





<b>P</b>	<b>U</b>	<b>L</b>	<b>S</b>	<b>E</b>
Potassium & Vitamin K	Warts	Lysine	Fiber	Soaking
North Dakota & Montana	Vegetable & Protein	Nitrogen	Hummus	Protein
Dry Peas	Flour	 Free Space	Coffee	Salt
Garbanzo Beans	Drink More Liquids	15 Grams	Heartbeat	Pulse Crops
Diabetic Diet	Lentils	Folate	All Three	Canned & Dry


<b>P</b>	<b>U</b>	<b>L</b>	<b>S</b>	<b>E</b>
Salt	Dry Peas	Fiber	15 Grams	Lentils
Coffee	Hummus	Vegetable & Protein	Lysine	Warts
Canned & Dry	Folate	 Free Space	Flour	Diabetic Diet
Drink More Liquids	All Three	North Dakota & Montana	Nitrogen	Heartbeat
Garbanzo Beans	Potassium & Vitamin K	Protein	Soaking	Pulse Crops


<b>P</b>	<b>U</b>	<b>L</b>	<b>S</b>	<b>E</b>
Diabetic Diet	Garbanzo Beans	Hummus	Drink More Liquids	Coffee
Warts	Dry Peas	All Three	Pulse Crops	Lysine
Lentils	Canned & Dry	 Free Space	Nitrogen	Flour
North Dakota & Montana	Protein	Folate	15 Grams	Salt
Heartbeat	Vegetable & Protein	Fiber	Soaking	Potassium & Vitamin K


<b>P</b>	<b>U</b>	<b>L</b>	<b>S</b>	<b>E</b>
Flour	Fiber	Dry Peas	Lentils	North Dakota & Montana
Canned & Dry	Diabetic Diet	Pulse Crops	Protein	Garbanzo Beans
Salt	Drink More Liquids	 Free Space	15 Grams	All Three
Folate	Soaking	Warts	Coffee	Heartbeat
Lysine	Vegetables & Protein	Potassium & Vitamin K	Nitrogen	Hummus


<b>P</b>	<b>U</b>	<b>L</b>	<b>S</b>	<b>E</b>
Pulse Crops	Salt	Flour	Hummus	All Three
Diabetic Diet	Nitrogen	Soaking	Folate	Coffee
Protein	Warts	 Free Space	Drink More Liquids	Heartbeat
North Dakota & Montana	Canned & Dry	Dry Peas	15 Grams	Fiber
Vegetable & Protein	Potassium & Vitamin K	Garbanzo Beans	Lysine	Lentils


<b>P</b>	<b>U</b>	<b>L</b>	<b>S</b>	<b>E</b>
Lysine	Vegetable & Protein	Diabetic Diet	Folate	Canned & Dry
Warts	Coffee	Potassium & Vitamin K	Dry Peas	Fiber
15 Grams	Salt	 Free Space	Drink More Liquids	Nitrogen
Protein	Hummus	North Dakota & Montana	Heartbeat	Garbanzo Beans
All Three	Lentils	Flour	Soaking	Pulse Crops


<b>P</b>	<b>U</b>	<b>L</b>	<b>S</b>	<b>E</b>
Drink More Liquids	Flour	Pulse Crops	Nitrogen	All three
Garbanzo Beans	Hummus	Soaking	Folate	Heartbeat
Dry Peas	Protein	 Free Space	Vegetable & Protein	Lysine
Potassium & Vitamin K	Lentils	Diabetic Diet	Canned & Dry	Salt
Fiber	Warts	North Dakota & Montana	Coffee	15 Grams


<b>P</b>	<b>U</b>	<b>L</b>	<b>S</b>	<b>E</b>
All Three	Dry Peas	Pulse Crops	Fiber	Drink More Liquids
15 Grams	North Dakota & Montana	Soaking	Folate	Coffee
Flour	Hummus	 Free Space	Vegetable & Protein	Warts
Potassium & Vitamin K	Diabetic Diet	Lentils	Canned & Dry	Salt
Nitrogen	Lysine	Protein	Heartbeat	Garbanzo Beans


<b>P</b>	<b>U</b>	<b>L</b>	<b>S</b>	<b>E</b>
Lysine	15 Grams	Coffee	Diabetic Diet	Folate
Canned & Dry	Heartbeat	Fiber	All Three	Hummus
Vegetable & Protein	Protein	 Free Space	Dry Peas	Drink More Liquids
Salt	Lentils	Nitrogen	Garbanzo Beans	Potassium & Vitamin K
Soaking	Warts	North Dakota & Montana	Pulse Crops	Flour


<b>P</b>	<b>U</b>	<b>L</b>	<b>S</b>	<b>E</b>
Protein	Salt	Fiber	Canned & Dry	Lentils
Heartbeat	15 Grams	North Dakota & Montana	Lysine	Garbanzo Beans
Coffee	Drink More Liquids	 Free Space	Vegetable & Protein	Folate
Potassium & Vitamin K	All Three	Diabetic Diet	Nitrogen	Flour
Pulse Crops	Warts	Soaking	Dry Peas	Hummus


<b>P</b>	<b>U</b>	<b>L</b>	<b>S</b>	<b>E</b>
Nitrogen	Folate	Salt	Drink More Liquids	North Dakota & Montana
Fiber	Coffee	Warts	Diabetic Diet	Dry Peas
Lentils	Protein	 Free Space	15 Grams	Lysine
Canned & Dry	Heartbeat	Flour	Potassium & Vitamin K	Pulse Crops
Garbanzo Beans	Soaking	All Three	Hummus	Vegetable & Protein

<b>P</b>	<b>U</b>	<b>L</b>	<b>S</b>	<b>E</b>
North Dakota & Montana	Nitrogen	Fiber	Flour	Warts
Hummus	Garbanzo Beans	Protein	Folate	Dry Peas
Heartbeat	Soaking	 Free Space	Potassium & Vitamin K	Canned & Dry
Vegetable & Protein	Salt	Coffee	Lysine	Lentils
Pulse Crops	15 Grams	Drink More Liquids	Diabetic Diet	All Three


<b>P</b>	<b>U</b>	<b>L</b>	<b>S</b>	<b>E</b>
Folate	Dry Peas	Lentils	Vegetable & Protein	Lysine
Protein	Garbanzo Beans	Soaking	Coffee	Diabetic Diet
Potassium & Vitamin K	All Three	 Free Space	15 Grams	Hummus
North Dakota & Montana	Fiber	Salt	Warts	Canned & Dry
Flour	Nitrogen	Heartbeat	Drink More Liquids	Pulse Crops


<b>P</b>	<b>U</b>	<b>L</b>	<b>S</b>	<b>E</b>
Hummus	Potassium & Vitamin K	Folate	Flour	Dry Peas
Coffee	Drink More Liquids	Diabetic Diet	Nitrogen	Fiber
Lentils	Warts	 Free Space	Soaking	North Dakota & Montana
Protein	Garbanzo Beans	All Three	Lysine	Vegetables & Protein
Canned & Dry	Heartbeat	Pulse Crops	Salt	15 Grams


<b>P</b>	<b>U</b>	<b>L</b>	<b>S</b>	<b>E</b>
Nitrogen	Drink More Liquids	Dry Peas	Salt	North Dakota & Montana
Soaking	Lysine	Canned & Dry	Fiber	Folate
Garbanzo Beans	Heartbeat	 Free Space	Protein	Warts
All Three	Diabetic Diet	Flour	Pulse Crops	Hummus
15 Grams	Potassium & Vitamin K	Coffee	Vegetable & Protein	Lentils


<b>P</b>	<b>U</b>	<b>L</b>	<b>S</b>	<b>E</b>
Salt	Warts	Folate	15 Grams	Flour
Protein	Dry Peas	Garbanzo Beans	Nitrogen	Fiber
Drink More Liquids	Hummus	 Free Space	Soaking	Heartbeat
North Dakota & Montana	Lysine	Pulse Crops	Lentils	Potassium & Vitamin K
All Three	Coffee	Vegetable & Protein	Diabetic Diet	Canned & Dry





<b>P</b>	<b>U</b>	<b>L</b>	<b>S</b>	<b>E</b>
All Three	Vegetable & Protein	Pulse Crops	Fiber	Lentils
Soaking	Dry Peas	Potassium & Vitamin K	Drink More Liquids	Garbanzo Beans
Coffee	Warts	 Free Space	Diabetic Diet	Lysine
15 Grams	Hummus	Flour	Protein	North Dakota & Montana
Nitrogen	Canned & Dry	Heartbeat	Salt	Folate


<b>P</b>	<b>U</b>	<b>L</b>	<b>S</b>	<b>E</b>
Soaking	Flour	Pulse Crops	Heartbeat	Coffee
Lysine	Diabetic Diet	Folate	Salt	Potassium & Vitamin K
Fiber	Vegetable & Protein	 Free Space	Garbanzo Beans	North Dakota & Montana
Lentils	Drink More Liquids	Warts	15 Grams	Hummus
All Three	Protein	Nitrogen	Dry Peas	Canned & Dry


<b>P</b>	<b>U</b>	<b>L</b>	<b>S</b>	<b>E</b>
Drink More Liquids	Soaking	Diabetic Diet	Garbanzo Beans	Salt
Lentils	Pulse Crops	Dry Peas	Potassium & Vitamin K	Hummus
Vegetable & Protein	Nitrogen	 Free Space	Canned & Dry	Heartbeat
Coffee	Folate	Protein	15 Grams	Flour
All Three	North Dakota & Montana	Lysine	Fiber	Warts

<b>P</b>	<b>U</b>	<b>L</b>	<b>S</b>	<b>E</b>
Folate	Coffee	Soaking	Canned & Dry	Potassium & Vitamin K
Dry Peas	Fiber	All Three	Flour	Drink More Liquids
Diabetic Diet	Warts	 Free Space	Nitrogen	Heartbeat
Vegetable & Protein	Hummus	15 Grams	Lysine	North Dakota & Montana
Salt	Protein	Pulse Crops	Lentils	Garbanzo Beans

<b>P</b>	<b>U</b>	<b>L</b>	<b>S</b>	<b>E</b>
Flour	Lentils	Dry Peas	All Three	15 Grams
Vegetable & Protein	Canned & Dry	Nitrogen	Folate	Lysine
Hummus	Protein	 Free Space	Diabetic Diet	North Dakota & Montana
Garbanzo Beans	Potassium & Vitamin K	Fiber	Drink More Liquids	Coffee
Soaking	Warts	Heartbeat	Pulse Crops	Salt

<b>P</b>	<b>U</b>	<b>L</b>	<b>S</b>	<b>E</b>
Garbanzo Beans	Protein	Flour	Coffee	Fiber
All Three	Diabetic Diet	Potassium & Vitamin K	Drink More Liquids	Lysine
Soaking	15 Grams	 Free Space	Salt	Heartbeat
Vegetable & Protein	North Dakota & Montana	Canned & Dry	Nitrogen	Pulse Crops
Folate	Hummus	Lentils	Warts	Dry Peas

<b>P</b>	<b>U</b>	<b>L</b>	<b>S</b>	<b>E</b>
Dry Peas	Nitrogen	Heartbeat	Pulse Crops	All Three
Fiber	Garbanzo Beans	North Dakota & Montana	Salt	Diabetic Diet
Folate	Lentils	 Free Space	Vegetable & Protein	Drink More Liquids
Coffee	Canned & Dry	15 Grams	Flour	Warts
Potassium & Vitamin K	Hummus	Lysine	Soaking	Protein

<b>P</b>	<b>U</b>	<b>L</b>	<b>S</b>	<b>E</b>
Canned & Dry	Vegetable & Protein	Garbanzo Beans	Heartbeat	Pulse Crops
Coffee	Warts	Soaking	Fiber	Nitrogen
Potassium & Vitamin K	Diabetic Diet	 Free Space	Flour	Folate
Lentils	Lysine	Protein	Hummus	All Three
Salt	North Dakota & Montana	15 Grams	Dry Peas	Drink More Liquids