

## WASSERLINSEN (Lemna)/ DUCKWEED

WASSERLINSEN (Lemna) is a genus of free-floating aquatic plants referred to by the common name "DUCKWEED". Duckweed, also known as Lemnaceae, is a family of small aquatic plants that belong to the order Alismatales. Duckweed species are found throughout the world (Rusoff et al., 1980; Landolt and Kandeler, 1987; Xu, 2011) except waterless deserts and permanently frozen areas (Leng et al., 1995), with most species inhabiting the tropical and subtropical areas (Greenway et al., 2007). Duckweed plants are small, green, fragile freshwater plants with a frond that is few centimeters wide and a short root which is usually less than 1 cm long (Becerra et al., 1995; Ahammad et al., 2003; Olorunfemi et al., 2006). If their nutritional and environmental requirements are met, duckweed plants grow very fast and can flourish for long (Iqbal, 1999; Al-Nozaily et al., 2000; Caicedo et al., 2000; Cheng et al., 2002; Cayuela et al., 2007; Lasfar et al., 2007). Duckweed plants can easily be established since they have the ability to reinvigorate when blown by wind to nutrient-rich sites. Luxurious growth often occurs through active extraction of nutrients in sheltered small ponds, ditches or swamps where there are rich sources of nutrients, making the plant highly nutritious (Willett, 2005; Khellaf and Zerdou, 2010). Such characteristics have made the duckweed a useful plant in various ways. Duckweed plants are often mistaken for algae due to their floating nature.



### Here are some key features and information about duckweed:

**Environmental Benefits:** Duckweed plays a significant role in the ecosystem by providing various environmental benefits. It helps in water purification by absorbing excess nutrients like nitrogen and phosphorus, which can reduce the occurrence of algal blooms. Duckweed also provides habitat and complement diets for aquatic organisms such as insects, fish, and waterfowl (Leng et al. 1995).

**Nutritional Value:** Duckweed is a highly nutritious plant and is considered a potential source of food and feed. It has a high protein content, similar to soybeans, and contains essential amino acids, vitamins (including vitamin A, vitamin B complex), minerals (such as calcium, magnesium, and iron), and antioxidants. It is consumed by humans in certain parts of the world and has gained attention as a sustainable food source.

**Potential Applications:** Due to its fast growth rate and ability to extract nutrients from wastewater, duckweed is being explored for various applications. It can be used in wastewater treatment systems to remove pollutants and excess nutrients. Additionally, it shows promise in biofuel production, animal feed supplementation, and as a natural fertilizer.

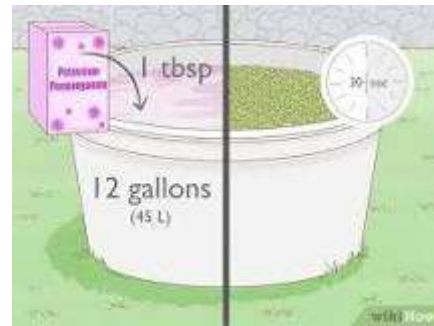
**Environmental Considerations:** While duckweed has many beneficial aspects, it can also become a nuisance in certain situations. If conditions are favorable, it can grow rapidly and cover large areas of water, limiting sunlight penetration and affecting other aquatic life. In such cases, duckweed management strategies may be necessary to control its growth

In Central Europe are originally native 3 species (Wikipedia) but *Lemna minor* L. is ranked top of the position (Simona Ceschin et al. 2018).

1. Bucklige Wasserlinse (*Lemna gibba* L.; Syn.: *Lemna parodiana* Giardelli)
2. Kleine Wasserlinse (*Lemna minor* L.)
3. Dreifurchige Wasserlinse (*Lemna trisulca* L.)

**Reproduction:** Duckweed is capable of rapid vegetative reproduction, allowing it to multiply quickly. It can reproduce **asexually** through budding or by producing daughter fronds that detach from the parent plant. This ability for fast reproduction contributes to its ability to form dense colonies in favorable conditions. An individual leaf may go through 10 divisions over a period of 10 days to several weeks before the original plant senesces. Duckweeds can double their mass in between 16 hours to 2 days under optimal nutrient availability, sunlight, and water temperature. A small amount can cover the surface of an average aquarium in one week

**Reproduction techniques:** Fill the container with some water from the pond. Then scoop some duckweed from the pond with your hand and place the duckweed into the container. Place the lid on the container to prevent splashing while you bring the duckweed home. Between 50-100 duckweed pods will be enough as they will grow and multiply quickly.



water with the lid

<https://www.wikihow.com/Grow-Duckweed#References>

## Method 1

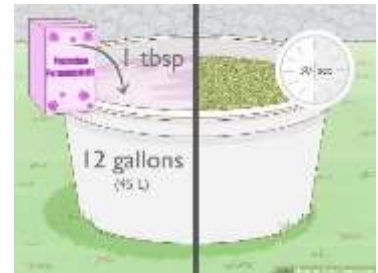
### Growing Duckweed Indoors

**Buy some duckweed at a pet store or harvest it from a pond.** You might be able to buy some duckweed from pet stores in your area. Otherwise, you can take it from a pond it's growing in. Fill your container with some water from the pond. Then scoop some duckweed from the pond with your hand and place the duckweed into your container.[1]

- Place the lid on the container to prevent splashing while you bring the duckweed home.
- Between 50-100 duckweed pods will be enough as they will grow and multiply quickly.

**Disinfect the duckweed with potassium permanganate.** You'll need potassium permanganate to disinfect the duckweed. Mix one teaspoon of this chemical in 12 gallons (45 L) of water. Place the duckweed into the permanganate solution for 30 seconds or so.[2]

- Potassium permanganate can be bought at your local pharmacy.
- Disinfecting the duckweed will make sure that it is free of pests and bacteria.



**Place the duckweed in a plastic tray with 12–14 inches (30–36 cm) of depth.** This will help you create a suitable environment for the duckweed to thrive in. Fill the tray with freshwater and add the duckweed to it. Use freshwater from a pond for best results but you can also use tap water.[3]

- You need to use freshwater as duckweeds are freshwater plants. This is why they only grow in ponds and not at sea. Salt water will kill the duckweed.



**Position the tray so it receives 10 hours of sunlight daily.** The best place to put the tray is right next to a window that receives at least 10 hours of sunlight each day. Like many plants, duckweed will thrive in direct sunlight. If you see duckweed in a pond, notice how the pond is almost completely without any shade and receiving plenty of sunlight.

- If you can't put duckweed near a window that receives 10 hours of sunlight, you can also use fluorescent light bulbs to help them grow. For best results, place the light bulbs 15 inches (38 cm) above the tray. The duckweed won't grow under these light bulbs as well as it would with direct sunlight.



**Change the water in the tray after 1 week.** Check the tray a couple of times a day and remove damaged duckweed from the tray. Replace the water in the tray with more freshwater.[4]

- It will take 10 days or so for the duckweed to multiply.



**Use a net to transfer the multiplied duckweed to your desired location.** If transferring the duckweed to a pond in your garden, make sure that the pond is receiving plenty of sunlight. If you're moving the duckweed to an aquarium, make sure that the aquarium lid has a light source attached to it.[5]

- Duckweed requires no further care or maintenance once it's in your pond or aquarium.
- You can get a suitable net in your local garden store.



## Method 2

### Growing Duckweed Outside

**Test to see if your pond's pH level is between 6.0 and 7.5.** Duckweed grows best at between these 2 numbers. To find out the pH of the water in your pond, dip some litmus paper into the pond. Depending on how acidic or basic the water is, the paper will turn a color between red (highly acidic) and blue (very basic). If the paper is between a dark yellow and lime green in color, the pond water is suitable to use for your duckweed.[6]

- Buy some litmus paper at your local pharmacy.
- If the pH of your pond is too acidic, use baking soda at a rate of 1 teaspoon for every 5–10 gallons (19–38 L) of water. Do this until the pH reaches the 6.0 to 7.5 range.[7]



**Create a pond if you don't have one.** The best place to dig your pond is an area that isn't low in elevation, has no muddy soil, and doesn't flood from excessive rain. Create steep slopes around the pond. The pond should be at least 3 feet (0.91 m) deep.[8]

- Don't place the pond too close to trees or to other things that might cast a shadow over it. Duckweed needs plenty of sunlight to be able to grow.
- Using a waterproof plastic tarp or a pond liner, cover the pond's bottom surface area. Make sure there is at least a few feet extra of tarp extending around the ditch.
- Cover the tarp with soil. Raise an edge/water-run-off barrier around it. Try adding some stones around the edges.



**Fill your pond with freshwater if you built a pond.** Duckweed will also grow in tap water once the pH is suitable. Fill your pond until the water reaches 1 foot (0.30 m) from the top of the pond. This will prevent flooding.[9]

- You might be able to buy large tanks of freshwater from your local garden store. If not, you can use tap water.



**Add a dechlorinator to your pond.** You can buy a dechlorinating agent at your local pet store. Read the packaging to find out how much water the agent is designed to treat. Unscrew the lid of the agent and pour the desired amount into your pond. This will remove chlorine from your pond.[10]

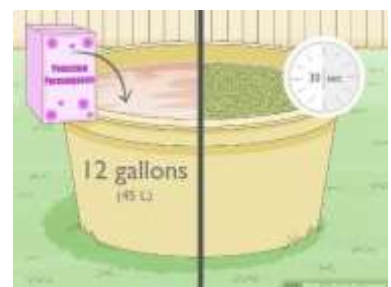
- Duckweed grows best in dechlorinated ponds.



**Buy duckweed from a pet shop or harvest it from a pond.** It's unlikely but you should check to see if your local pet store sells duckweed before you head to the local pond. If the pet stores don't have duckweed, find a pond with duckweed in it. Fill a container with fresh water from the pond and scoop the duckweed into the container.[11]

- 50-100 duckweed pods will be enough.
- You can also use plastic drinking bottles to collect the duckweed. Just make sure you've properly washed the bottle out beforehand.

**Disinfect the duckweed with potassium permanganate.** You can buy this chemical from your local pharmacy. Mix one teaspoon of potassium permanganate in 12 gallons (45 L) of water. Add the duckweed to this mixture and let it sit for 30 seconds. When the 30 seconds are up, remove the duckweed from the mixture and add it back to your container of freshwater.[12]



**Add the duckweed to your pond.** Take the containers to the pond and place the duckweed into your pond. After 10 days or so, you should be able to notice the duckweed multiplying.[13]

- If you're putting other plants in your pond, pick plants that don't require plenty of sunlight. The duckweed will block most of the light from entering the pool.
- Duckweed requires no further care or maintenance once it's in your pond or aquarium.

