

D Family and Household, D6 Growing and Raising

## ***Urban Gardening and Home Growing of Vegetable in Flowerpots, Small Herbal Garden***

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Recommended year	<i>6.–9.</i>
Timeframe	<i>6 school lessons / hours, long term projects</i>
Thematic block	<i>Urban gardening and home growing of vegetable in flowerpots, small herb garden</i>
Interdisciplinary (cross-curricular) relations	<i>Physics – measuring the intensity of incident light radiation and light Chemistry – the measurement of Ph, biology-photosynthesis, plant cultivation</i>

### ***The methodological part for teachers***

**The goals of the topic:** The aim is to acquaint students with the basics of the cultivation is carried out various experiments with watercress, for it is growing rapidly. Because this is a short term cultivation, also makes use of the waste of material to the place of the flower pots and boxes. This material is used because of the different experiments. Monitoring growth, root volumes, but also the response to various growth conditions. Some of the parts can also be measured, if they are available to do this. Represents the different ways of growing such as Hydroponic growing.

#### Alternative „with Equipment:“

**Motivation:** Submit snapshots of an image "from the supermarkets ' everything is available for the vegetables. Discussion and list on the Board, what fruit or vegetables/tasted. The split is on the "local" and "foreign". If the internet is available, you can try to find pictures "banana plantation", "bananas". The images can be seen as carriage collection. He's suggesting that it is not simple, and how long it takes, that they get the bananas to the stores. Recommend your own cultivation, where it is a fresh and if it is possible, even without chemical treatment.

#### **Teaching schedule:**

Activity 1 – How the plants grow (without a work sheet): long-term photo shoot, create a video of 30 minutes. Theory: growing plants and hydroponics (15 minutes)  
working sheet 1 – Hydroponics – Cress (short-term project 2-5 days)  
work sheet 2 – the pH of water and clay (45 minutes)  
worksheet 3 – pH of water and clay – Pasco (45 minutes)  
worksheet 4 – experimental verification of the influence of external conditions on growth (a short-term project for 2-5 days)  
worksheet 5 – plants and their country of origin (2 x 45 minutes)  
worksheet 6 – Sprouted seeds and young shoots as a food (2-7 days)  
working sheet 7 – preparation for the cultivation of the soil ( 45 mins)  
worklist 8 – herbs and spices for flavor, aroma and decoration (long term, according to the type of herbs)  
worksheet 9 – Vegetables from the pot (long term, depending on the type of vegetables)

**Evaluation** – fulfilled/not fulfilled – *populating worksheets (search, supplemented by data, measured values), the project diary*

**Forms and organization of teaching** – group work, individual work, separate domestic work, normal classroom, specialized space - school garden.

Equipment: *mentioned in the resolution and the guidelines for teachers. The appearance of the gardeners diary is visible in the worksheet 9, when in some cases, we release a portion of the table size.*

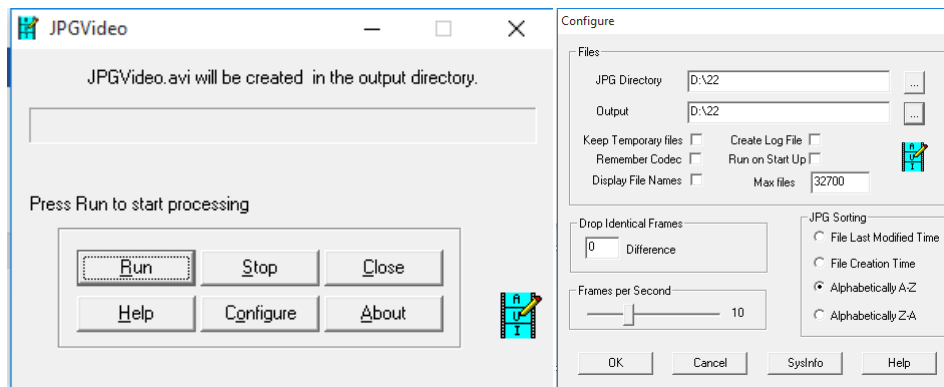
## ***Teoretical introduction***

From a historical point of view have been experimenting with targeted cultivation of plants to ensure food is an important step in the transition from harvesting wild fruit to modern agriculture, from lack of food, up to date, surplus crops and food in Western society. Mere consumption goes against the people's fondness for gardening. Because not everyone has their own little Garden House, develops, more and more domestic cultivation in pots and other appropriate containers and common community growing on roofs of buildings or public places. It's called urban gardening, English "Urban Gardening" and it's not about growing flowers, but mainly the edible herbs, spices and some vegetables.

When systematic cultivation experiments in school and at home you need to write down all the important information about the external conditions that have an impact on growth. This is the so-called gardeners diary. To him every day writes the data on the grower of cultivated plants. Thanks to this we can compare, for example, the effect of lighting, temperature, the suitability of a particular kind of soil, soil moisture, and the toppings or the effect of the ingestion of fertilizers on the growth rate and the quality of the crop. Today there are modern appliance, you can use variables such as the intensity and duration of sunlight, pH, or even objectively to determine soil moisture measurements. The measured values and the relations between the external conditions and the speed of growth can then enter the spreadsheet MS Excel, computationally and graphically display process through development and column charts.

### ***Activity 1 – How plants grow (without the worksheet)***

**Equipment:** : the computer, the camera (mobile phone with a camera), software to enable pupils to follow, as the plant grows, you can create a time-lapse video. On a regular basis will grow to take pictures every day, a few photos. It is suitable to create a camera or even a mobile phone. Photography is always should be of approximately the same place. If the photo shoot, upload them to your computer and with the help of this program you will create a video. You need to have multiple images because for smooth video must be at least 10 frames per second. We will use the freeware program JPGVideo, click configure.



1. Set the folder where the input photo (JPG) set the folder for the output video (Output)
2. Set the number of FPS (Frames per Second)
3. Set the sort photos (JPG Sorting)
4. Then click on OK.
5. We will get to the first menu, and Run
6. A window will appear to select the codec.
7. We choose are known or Microsoft Video 1.
8. We wait after we find our video in the output folder.

In the case of mobile phones or tablets can be found under the programs key words for time-lapse videos "time lapse" or the way of creating a "stop motion ".

## Work sheet 1 – Hydroponics – Cress

Equipment: : watercress seeds, a variety of shallow containers (plastic), cotton candy, water, mikrotenový bag, (possibly Binky and soil)

## Work sheet 2 -the pH of water and clay

Equipment: : Water, we'll be watering container, litmus paper, clay, distilled water. This task does not pose significant problems. Litmus paper on pH measurements are easily found and the price is not considerable. Distilled water may not have exactly the pH 7, but may vary according to the manufacturer. Details can be found on the sheet from the manufacturer.

Before using and mixing with clay we recommend that you change the pH of distilled water. If there is not enough containers, take advantage of the cross-cut PET bottles or tetrapak packaging, must be well rinsed.

### Work sheet 3-pH of water and clay – Pasco

Equipment: : computer or tablet, SPARKvue, Pasco pH sensor Software, PascoSparklink, water, which we'll be watering container, distilled water, clay at work to give the fragility of the pH sensor. Measurement in that program is simple. It is not necessary to read from the chart, it is values. Distilled water may not have exactly the pH 7, but may vary according to the manufacturer. Details can be found on the sheet from the manufacturer. Before using and mixing with clay we recommend that you change the pH of distilled water. If there is not enough containers, take advantage of the cross-cut PET bottles or tetrapak packaging, must be well rinsed.

### Work sheet 4 - the experimental verification of the influence of external conditions on the growth

Equipment: : watercress seeds, a variety of shallow containers (plastic), cotton candy, water, mikrotenový bag, (possibly Binky and soil), if possible photometer.

### Worksheet 5 - plants and their country of origin:

Internet-enabled device (PC, tablet).

### Worksheet 6 - Sprouted seeds and young shoots

seeds see the worksheet, a variety of shallow containers (plastic), cotton candy, water, plastic bag.

### Work sheet 7 – preparation for the cultivation of soil preparation for work sheet 8, 9.

### Worksheet 8 - herbs and spices for flavor, fragrance and decorative

Work sheet 9 - Vegetables from the pot some activities can be carried out on the school garden.

Utilities: water, soil , seeds, herbs (Mint, lemon balm, basil, chives, etc.), the seeds of vegetables, containers: non-backed plastic, tetrapakový cover, Cup of the yogurt.

## ***Worksheets***

### **Theory: Growing plants and hydroponics**

Plants need oxygen in the daytime instead of carbon dioxide for photosynthesis, the process by which not only grow, but also producing oxygen, which then animals and man breathe. This whole process is powered by the light energy taken leaves of plants from sunlight. Without the Sun, life on earth would be limited. The more light out on the leaves of plants, the faster you grow, and the more oxygen they produce. At night, instead of sleeping and also plants for the conversion of carbon dioxide to oxygen slowly consume a small portion of oxygen produced by the day.

A physical characteristic that conveys the light power emitted by the surface of a certain size or accepted is the intensity of light emission. The auxiliary variable called lighting is used for easier comparison of lighting conditions in practical life and is measured in Lux (Lux).

There are several ways of domestic plant production. Of them the simplest and purest is growing completely out of clay in water only. As a basis for the plants is used nasákavá for example, pulp, plain cotton wadding. At the beginning of the sprouting of the motif still uses the nutrients stored in the she or the fetus. Later the nutrients a plant grown by hydroponics does not receive from clay, but only of the nutrient solution, which is a pulp soaked. For plant growth are important chemical elements nitrogen, potassium and phosphorus. Those are contained in the liquid and dry bulk fertilizers. For larger plants grown without soil in the water there are only special potting mix to the bin as expanded clay.

Information – for simple Hydroponic growing fits only certain types of plants. One of the first plant, with which you can start with a home pěstitelstvím is the Cress. It grows quickly and in a few days you can first výpěstkem sprinkle the bread with butter or add it to vegetable salad. Tastes a bit like radish and is very healthy. Contains vitamins C, B, A, E and the minerals potassium, sodium, calcium, phosphorus, iron and iodine.

## Worksheet 1 – Hydroponics – Cress

Exercise - prepare a shallow container, such as a flat plate or a bowl with water and cotton candy. According to the instructions on the bag sprinkle seeds evenly on a thick layer of wet cotton wool and leave to germinate. You can sow very densely almost one next to the other. Always keep a damp cotton wool. The more sunlight falls on the bowl with the plants, the faster it evaporates water. Therefore, the seeds sprouted not just behind the window on the inner window sill, where turns out direct sunlight, nor on the heater, but away from the window inside the room should be on the kitchen table. Cotton wool in bright sunlight quickly dries up and the plants will wither and die. The evaporation of water from the cotton wool can be restricted so that the entire tray or plate with klíčícími seeds you put into mikrotenového the bag. Let it a little open.



Exercise – Approximately after two days, when the germ of a stem with leaves, remove the tray from the mikrotenového bag. Seeds or sprouts but not even then never dry. This also applies to being motivated by the small rostlinkách. If you forget to water and tickets zavadnou rericha, it quickly zkonzumujte. After about five days, grown watercress to a height of a few inches. Soft green stems with the leaves just cut the hair using just the surface of wool with scissors. It can be harvested in parts, and watch how it changes during growth of its stature, the color and the taste.

Exercise - Few watercress seeds sow separately on a smaller plate. Plants leave the wool and watch on their growth up to the stage of formation of flower and seeds. When the plants will be too large, repot them into the bin with soil. From mature plants, remove the seeds for the next planting season. Still, keep records of this cluster of plants in the growing of the gardeners diary.

Exercise - Track increment of plants every day and write it to the table. You can also place the ruler vertically into a container with plants and to each of the photos to record the height of the stem, and the size of the leaves.

After the harvest of all the stems and leaves of watercress well see the root system of the plants that had grown in the cotton wool. The roots of the watercress, although he doesn't eat, but along with the cotton wool are biodegradable waste that can be used in compost..

## Worksheet 2 – the pH of water and soil

What is water used for watering? Without water, the plants shouldn't grow one. Best rain, if you don't live right in the Centre of the big city. Even plants have requirements for water quality. How to find out? On the water, we can measure its pH. The appropriate value is 6.5 pH.

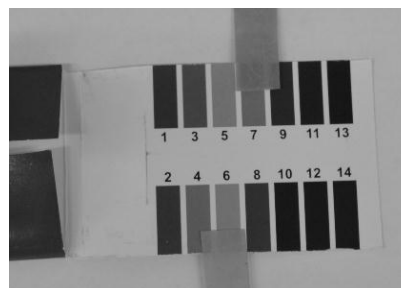


Utilities: water, which we'll be watering container, litmus paper, clay, distilled water

**Litmus paper:** dye reactive with water intended for determination of the pH value the pH value: the scale was intended for determining the pH of the solution is measured by the acidic or alkaline. For the test, litmus test it is determined by the colour of the paper. The scale is from 0 to 14, where 7 to determine the outcome of the past as a neutral. Values less than 7 are acidic, and values greater than 7 is alkaline..

**pH test for water:** slightly soak the paper in the water and allow it to respond. By comparing the paper with a scale to determine the approximate value. Today it is also used by electronic devices for measuring pH.

**pH test for soil:** Mix a small sample of clay with distilled water. This water should be freed of all minerals and nutrients. Its pH is about 7, so it is neutral. Then we see a change, whether it is the soil more acidic or becomes. If the pH is low, slowing down the growth of plants. If it was high, cannot land well to receive trace elements. The optimum is a neutral, i.e. the values of around 7. For the herbs suited soil slightly alkaline.

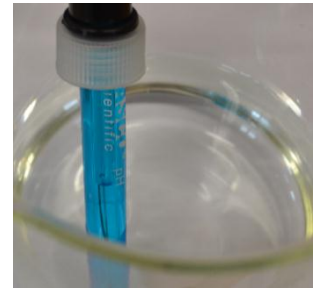


PH test of water		pH test for soil	
1.		1.	
2.		2.	
3.		3.	




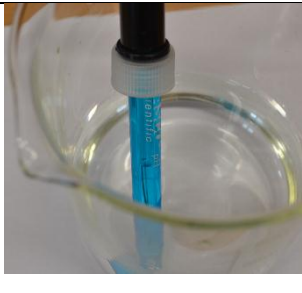
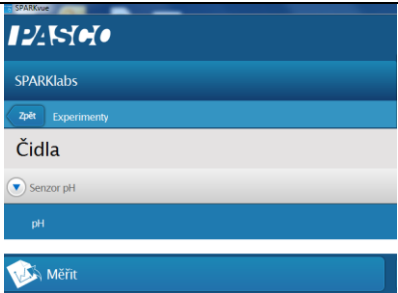
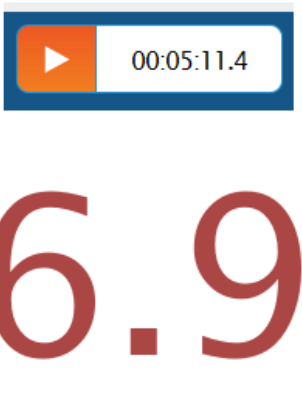

## Worksheet 3 – pH test for water and soil - Pasco

What is water used for watering? Without water, the plants shouldn't grow one. Best rain, if you don't live right in the Centre of the big city. Even plants have requirements for water quality. How to find out? On the water, we can measure its pH. The appropriate value is 6.5 pH neutral or approximate value of around 7.



Equipment: PC or tablet, SPARKvue, Pasco pH sensor Software, PascoSparklink, water, which we will water the vessel, distilled water, clay

PH value: the scale was established for determining the pH of the solution is measured by the acidic or alkaline. The electrode is placed in the sensor reacts to the conductivity of the solution on the base of the output voltage is determined by the value of pH. The scale is from 0 to 14, where 7 to determine the outcome of the past as a neutral. Values less than 7 are acidic, and values greater than 7 is alkaline.

<p>Connect the pH sensor to PascoSparklink.</p>	<p>Carefully unscrew the cover of the pH sensor and insert into the water.</p>	<p>SPARKvue Software, Click Start on the experiments, pH sensor and measure</p>
		
<p>Start the measurement and the pH value.</p>	<p>In the lower right corner, we can switch to display the values.</p>	
		

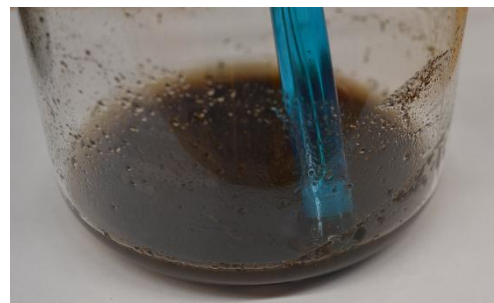


Worksheet 3 – pH test for water and soil – Pasco – Answer sheets

Test	pH value

From measured values calculate mean value

It is now appropriate to measure the pH of the soil. Do we do that so that we mix a small sample of clay with distilled water. This water should be freed of all minerals and nutrients. Its pH is about 7, so it is neutral. However, before mixing the pH of distilled water measure. The sensor should be more submerged we can tilt the container. Then we see a change, whether it is the soil more acidic or becomes. If the pH is low, slowing down the growth of plants. If it was high, cannot land well to receive trace elements. The optimum is a neutral, i.e. the values of around 7. For the herbs suited soil slightly alkaline.



Test	pH value

From measured values calculate mean value

## Worksheet 4 – Experimental verification of the influence of external conditions on the growth

Exercise – compare the influence of external conditions on seed germination and growth of shoots. The results of the write to the seed journal. The plant will serve as the test again first us Cress. Sow the seeds from the same bag in one day to a few dishes with the stuffing and place them on different Windows. This time the sow only sparsely. Candy in all the bowls keep sufficiently moist. Watch the growth rate depending on the location. Each dish you describe the date of sowing and location, such as "North-Western window". Increase in the measure with a ruler and take the photo documentation. Then you can sort photos into a directory by date or by location. Cress will serve as biological you meter the light intensity and exposure time.

On which the growing?

Where the slowest?

Compare the results of an experiment with lighting sunlight measurements using the luxmetru (if available). Lethal – like the effect of lighting on the growth of the Sun you can detect even the influence of other factors, such as the temperature in different rooms with the same orientation of the Windows against the cardinal as the inner window sill in the cold corridor and vice versa in a heated classroom or in the apartment. When you place the same seed next to each other on one window, observe and compare the speed of germination and growth of seedlings in soil with the growth of the seedlings grown by hydroponics. Always compare at least a pair of identical plants raised in the same conditions with only one different environment.

In this way the influence of fertilizers on the growth of mŕžetezjistit, when you place a few boxes next to each other and in each you will dispense a different amount of fertilizer. The increment of each group of plants regularly measure, take photos and write results to the seed journal. What is the dependence of the growth of a particular type of plant on the quantities delivered nutrients? Information – if we grow plants for food, it is necessary to give always a big attention to the dosage of the fertilizer. Fertilizers may be poisonous itself. Therefore, before you eat the plants already and we give out fertilizer on, we did not eat parts of the plant that have been in direct contact with fertilizer, and can include its higher concentration. The plants that you have scientific reasons tried high doses of hnojeni, then I'd rather do not eat or after discontinuation of high doses of fertilizer, wait a long time!

## Worksheet 5 – Plants and their country of origin

Information - Cress is native to Central European plant. She came to us as a lot of other crops and varieties of grape varieties from the Orient. Also the method used for hydroponic growing is not a European invention. It is known from ancient Egypt.

Exercise – about what other kinds of fruit, vegetables, spices and herbs is the richer our diet thanks to the trading and meeting of Europeans with geographically distant cultures of Africa, Asia, the Orient and America? Locate the historical origin of the favorite species of these plants on the Internet. Country of origin specified on the fruits and vegetables sold in the supermarket is the country in which they are grown at present. Empty boxes in the table add vegetables and fruits that you like and is often you eat. Where they come from and where it is most commonly grown today? Which of these would you think it was possible, it was possible to grow at home in the bin?

**Tab. 1: The origin and the growing conditions of vegetables and herbs**

Plant	The historical origin	Where is grown bought vegetables?	Growing in the garden	Growing inside the apartment
potatoes				
rice				
corn				
tomatoes				
paprika				
cucumber				
pumpkin				
Basil				
thyme				
Mint				

Food for thought – How would look just pure Central European diet without the exotic species and varieties of fruit, vegetables, spices and herbs, recipes and dishes from other countries and continents?

## Worksheet 6 – Sprouted seeds and young shoots as a food

Information – Cereals such as wheat or rye and pulses such as beans or peas, of course at home so easily and quickly like *řericha nevypěstujete*. However, you can develop their fresh young shoots. Sprouted grains due to the action of water, sunlight and air breaks down organic substances stored under the skin inside the seeds. Sprouted seeds and shoots, however, are much more palatable to humans than the dry seeds and are thus more easily usable for us a source of many essential vitamins and minerals.

Exercise – That it is possible to consume the seeds sprouted? Find out on the Internet that the seeds germinate easily, and try them germinate. The germination process is very similar to the beginning of the cultivation of watercress. Larger hard grains and legumes, intended for direct consumption, leave at room temperature for one to two days to swell the whole immersed in a pot with the water. Because you consume just a germ and plants fail to create or the root system, not unlike the plant watercress underlying *materiálemprorůstat*. All you need is so common a lot instead of wool and a wet dish towel laid on a bowl, a plate or tray. You can then use the cloth almost endlessly. The second wet towel, cover the seeds. You can speed up the process by coaster with cloth by *mikroténového* whole bag or tray down with it.

Information-seeds for planting, due to storage of stained with pesticides and fungicides, to prevent their infestation by pests and fungi, mould and premature germination. Therefore, do not eat the seeds or planting so treated dry or sprouted. They don't taste good, it would be you of them poorly and may even be poisonous.

Exercise – In advance as deep and swollen seeds germinate on the second or third day. With the consumption but wait a couple more days. The tastiest and most nutritious sprouts after about 5 to 7 days, when there are already several centimeters long. Larger and older *zhořknou* gradually growth sprouts. Try every day sprouted shoots taste and write the result to the table. Find out the match which is a taste of the best shoots.

Exercise – Taste you the freshly sprouted seeds? On the Internet, a variety of recipes for healthy salads from *klíčěných* cereals and legumes. Maybe now you'll want to eat more frequently. Try experimenting with the different procedures of germination and production

vessels. You don't need to buy expensive equipment from health food shops. Place towels to try to use a flat plastic colander or sieve laid on a plate with water. It spread a single layer of seeds. In the bottom of the saucer still top up water, to prevent soil from the keys. The next plate from above as the lid close the strainer to make water neodpařovala and inside remained wet. The seeds also every day, flush with fresh water, that has not begun to fester or's starting to mold. Experiment with the necessary length of the previous explosion. What is the swell effect on the rate of germination?

**Seeds suitable for the cultivation and consumption of sprouts and the young shoots**

The kind of seed	Time of growth of the germ	Taste	Time of growth of the germ	Taste
Cress				
Mungo beans				
beans				
Lens				
Peas				
Buckwheat				
Wheat				
Barley				
Rye				
Sunflower				
Sesame seed				
Flax				
pumpkin				
Basil				

## Worksheet 7 – Preparation for the cultivation of soil

For the first experiments with domestic cultivation in soil do not just buy pots and flower boxes. Find a variety of containers for growing at home. You can use even a retired old pot, mug, Bowl, pot or an old bucket. You can also use the containers which would otherwise have ended up in the garbage or for edit. Suitable are opaque cups bowls from food, such as yogurt, beverage and cardboard packaging (Tetra-Pack). You will need just a bag with soil.



Exercise – Beverage carton Tetra-Pack, you can trim with scissors to create a bowl with a large, easily as you need. Compared to PET bottles has the advantage that it does not penetrate inside the light, it is not reversible and cannot be fully recycled. In addition, thanks to the rectangular shape, you can easily put next to each other and make use of the space on the windowsill to the last free. The best way to modify the carton is cut out it just a small circular or rectangular hole in one of the walls, which will be the top of the wall. For example, in the narrower side of the wall. It remains then firmer and will not evaporate from water or pouring out of clay. You may remain completely odšťihnutý, as a regular planter.



Tip - Growing container can paste it into other larger container that you use as a water bowl. Into the inner Bowl then do the bottom by a few holes, which will drain the excess water or dirt on the contrary sucks the water out of the bowl. Plants water regularly and do not overflow.

As a tip jar on growing outdoors, you can take advantage of even an old wooden box, into which you insert one or more layers of strong neprůsvitného polythene. You can use black garbage bag. When you insert multiple bags to itself, to reduce the likelihood of rupture and leakage of water. Therefore, it is preferable to place the container outdoors or where a water leak or spill out of the soil spoil the floor.



## Worksheet 8: Herbs and spices for flavor, aroma and decoration

Fresh herbs and spices belongs to every kitchen. Herbs and spices in pots from the supermarket they look at first glance. It seems to be easy to get them just to the shopping cart and then at home on a window. But even the best gardener, these plants die after a while.

Why? They are in fact varieties bred for fast consumption, have been grown in a sterile environment of the greenhouse and have transport to the store. Much better is to grow your own herbs and spices directly from the quality of the seed. Seeds of plants that make up the flower and fruit plus, then you can with great success right away again to sow. The seeds of what kinds of herbs and spices are available in horticulture?



Lemon balm



Basil

Exercise – Let the seeds germinate the first herbs like reriha. An appropriate moment for transplanting seedlings from germinated seeds in a pot filled with soil is when a plant grows a few inches and height already begins to create the root system, which is already in a shallow container with vatounevejde. The roots when transplanting do not remove and carefully position the entire plant to a pot with soil, the roots well přihřněte and still keep the soil lightly moist. Describe the germinating bowls and pots, species and variety along with the date of sowing and planting in soil. It will be much easier to write the gardeners diary.

For discussion – herbs and spices scent the entire apartment and aftertaste and an ordinary food. In which meals you found them? Which herbs were?

Exercise – Most plants will germinate and take root successfully and straight in the soil. Compare the speed of germination and growth of our first experimental plant, watercress, the wool and the germination seeds sown in pots with moist soil. Try again with other herbs and spices. Keep records of the date and the stages of plant growth and compare the rate of growth of seeds germinated on the wool with the growth of herbs and spices sown directly into the soil. What is the role for the germination of humidity of the substrate? What is the role of the air access?

Try out – from fresh herbs, you can prepare an herbal tea. Just picked the leaves to sprinkle the hot water and let steep for 10 to 15 minutes.

## Worksheet 9 – Vegetables from a flower pot

Even for large plants such as tomatoes or Zucchini does not need to buy in horticulture seedling and it is possible to grow the plant indoors from seeds. The seeds are expensive, and their naklíčení is as simple as the cultivation of watercress on the wool. The important thing is just to keep the dish with the stuffing does not run dry. If you fail even after you try to germinate the seeds of the subsequent or from high-quality seeds, do not despair and buy in gardening have grown seedlings. Try the home cultivation of one of the following types of vegetables. Keep a journal of cultivation from the date of sowing seeds or planting purchased seedlings until the date of the most recent harvest.

Day	Date	Phase of growth	Stem height	Leaf size	Fruit size	Color
1.						
2.						
3.						
n.						

(gardeners diary sample – create yours on a new worksheet)

Exercise – First try to leave to germinate the seeds of fruit purchased vydlabaná tomatoes, peppers or Zucchini. The varieties of vegetables bought in the supermarket are cultivated mainly on the products, their seeds germinate and the plants too badly do not breed, but it is a good start for the trial's production process. This is because the seeds will cost nothing. Or we don't eat them often, and when it is nerozkoušeme, just as the body without the benefit of excludes. Once you have natrévaný the correct procedure of germination, sow the seed quality of horticulture.

Exercise – Compare the taste of home-grown vegetables, vegetables from the supermarket. Which tastes better?

Plant	Plant size	Fruit size	Taste
cherry tomatoes			
Chilli Peppers			
Mini-zukini			
Eruca			
Beans			
Strawberries			