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Breeding and agrotechnics of rape (*Brassica napus* L.). Winter rape - distribution, cultivation and investigation in Bulgaria

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Abstract

Grown for its oil content, oilseed rape (OSR) or rapeseed (Brassica napus L.) is the most significant plant of the genus Brassica. If more nations and more land can be used to grow rape, then breeders must find ways to make the crop less acidic ("0" type) and less glycosinolytic ("00" type"). A successful crop, rapeseed has only just been reintroduced to our nation. Researchers looked at the possibilities of the newly-introduced winter and spring rape cultivars. Researchers looked at and developed methods for growing novel hybrids and variations in Europe and throughout the globe. Rapeseed breeding in Bulgaria has been restarted with the use of newly gathered and evaluated beginning material. The focus of the study was on rapeseed heterosis and the development of parental forms.

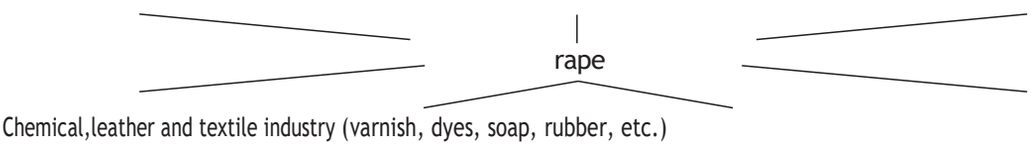
Keywords: *Brassika napus* L., breeding, winter rape, hybrid

Introduction

The genus Brassica includes rapeseed (Brassica napus L.), as well as turnip, radish, shepherd's bag, mustard, and other members of the family Brassicaceae. In 1998, FAO released statistics showing that one of the world's largest germplasm collections consisted of 106,923 accessions belonging to the genus Brassica, which includes crops such as mustard and rapeseed. Words like "rapum" or "rapa"—meaning turnip in Latin—are the origin of the term rapeseed. According to Erić et al. (2006) and shown in Figure 1, brassica napus has several uses, including in the industrial sector, as well as in human and animal nutrition. You may use winter oilseed rape as green fodder since it is very nutritious. There may be as much as 4 kilograms of protein, or 16 beetroot units, in 100 kilograms of green material. There are 180–190 grams of protein in one serving of winter rape beetroot greens. You may use the excellent protein meal that comes from digesting seeds to make compound feed. According to Staneva et al. (2007), soybean meal has a high amino acid content and includes 45–49% protein. Seed meal from varieties lacking eruc glucosinolates has small levels (up to 0.5%) but is of the same quality as soybean meal. Bees also eat rapeseed while they're young. Per half hectare, you may harvest honey up to 10 kg. A rise in biofuels, as opposed to oil derivatives, is mandated by the European Union Directive No. 30 of 2003 (Directive 2003/30/EU), and it is one of the "energy crops" (Directive 2003/96/EU; Regulation 1782). Rudolf Diesel himself acknowledged the possibility of getting diesel from oil plants as a substitute fuel source in 1912 (Wagener-Lohse, 2006). Bulgaria could be able to make biofuels, says Todorova (2006). Approximately 460,000 hectares (ha), or 8% of all arable land, was left uncultivated between 2002 and 2007 (according to MAF). The Sofia-based Institute of Soil Science "Poushkarov" has created a GIS to assist farmers. All of the items

research on farmland with an eye on selecting the best circumstances for growing energy crops for use in

biofuel production (Banov and Georgiev, 2006).
Soil structure, water permeability, and aeration are all enhanced by rapeseed's deep and rapidly expanding root system. A significant level of soil protection is achieved by the winter varieties. Green manure made from rapeseed is an effective alternative to traditional manure fertilizer for rice fields. Reducing root rot damages in wheat, it promotes plant health and soil quality. To prepare the fields for the next crop, rapeseed is harvested first to clear them of weeds. As a result, the efficiency of the utilization per space is enhanced. Oil World reports that rapeseed output reached an estimated 51.6 million tons in 2007, up from 47.2 million tons in 2006, based on their statistics. China is first in OSR production, with India, Canada, Germany, France, and the UK following closely after (Marjanović-Jeromela et al., 2008). The demand for rapeseed processing and export is expected to rise due to the development of new varieties, the building of refineries for processing rapeseed oil, and Bulgaria's upcoming EU membership. Bulgarian rapeseed plantings increased from 1,200 hectares in 1997 to 11,000 hectares in 2005 (Staneva et al., 2007). greater and greater plots of arable land have been used to cultivate rapeseed in recent years (Table 1). It is embodied by hybrids and foreign cultivars that are defined by an abundance of oleic acid in their oil. When it comes to oil-producing plants, the genus Brassica is dominated by oilseed rape. Rapeseed is the third most widely cultivated oil seed crop in the world, after palm and soy. Depending on the unique agroclimatic conditions and production in Bulgaria, the average seed yield varies among types, but on average, the seeds contain 41-44% oil. Honeybeared plant



ought to be capitalized on. In the new breeding program for the development of Bulgarian varieties, male sterility can range from having no stamens at all to being able to meet the new agronomic and economic conditions. This condition was defined by the Dobrudzha Agricultural Institute (Bulgaria) as of last year, but it is not always the case. The primary stage is to collect and characterize beginning material, and then the viability of the pollen is determined by their dehiscence and release. For example, Shukla (1994). The majority of the time, the CMS feature is caused by interspecific or, more rarely, intergeneric hybridization, which may lead to aloplasmatic sterility in imported winter and spring rapeseed types. Researchers looked at rapeseed. The Ogura-CMS system (INRA, France) and the MSL-system (Germany) are two systems that have been designed and examined for the purpose of cultivating novel varieties and hybrids. The most popular ones are from the Work Lembeke Institute. By fusing rapeseed protoplasts with genes for commercially relevant features, including the presence of Rf radish (Raphanus sativus), the Ogura/INRA CMS is aiming to generate parental forms with transferable systems. The MSL system was developed by a combination of natural selection, spontaneous mutations that occurred during backcrossing, and genes that regulate disease and pest resistance. The CMS exploits heterosis.
feature is not constant as, at high temperatures, partial fertility is conceivable. In contrast to competing systems, Ogura CMS is reliable.Planting, transplanting, and collecting

und er unterschiedliche klimatische Bedingungen. This is Ogura's primary issueThe fertility-restoring gene (Rf gene) of winter rapeseed is closely associated with each season and plays a pivotal role in its production. The genes responsible for determining germination and high glucosinonates content are most active in the fall (Renard et al., 1998), and frost is a potential threat in the winter. In 1997, according to Yang et al. (1999). Now is the moment for integrated pest management methods, according to Atlagić et al. (2008), when spring arrives. Conditions for housing may also be considered during this cytogenetic analysis of CMS stability after introduction season. Various varieties of CMS affect rapeseed, and diseases like sclerotinia manifest in the summer. It's also important to distinguish between inbred strains of rapeseed. The male sterile drought and high temperature inbred lines were all that were considered. The fact that there may be varying degrees of anther development is another potential drawback. There was an overabundance of moisture as the crop was being harvested.
This generation's offspring proved that both CMS sources are reliable, andWe discovered two genotypes that

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thrive in the soil and climate of Bulgaria. Canola was present in all of the CMS types that were studied. Its post-meiotic division exhibited reactions, but its regular meiotic phases could be cultivated on any soil type with a neutral pH. The ideal conditions are dark-gray forest soils with a clay-sandy mechanical structure, as well as rich, fertile soils free of "chernozem" abnormalities that halted microsporogenesis. tetrad phase is a common one. Unfavourable soils include those that are too light, too sandy, too marshy, or too salty, and similar findings were reported by The soils analyzed by Atlagić et al. (2003) and Atlagić et al. (2007). One crucial need is that soils are not capable of forming crust. Rapeseed oil There has been a lot of progress in breeding for tolerance to temperate climatic requirements. This plant thrives throughout the long days. Casting Light results in fewer blooms, smaller blossoms overall, and a concentration of roots in the upper 60–90 cm of soil, along with the pods and seeds therein. Seed filling in low-light conditions is The fundamental explanation for the 15-20% drop in seed weight is that rapeseed has a deep root system, which is superior to a shallow one. It is necessary to take root during droughts. Depending on their weight, seeds need 70–100% water for germination, without which their taproots may not mature entirely. as compacting soil but still containing organic matter that has not degraded What to do if the top layer of soil is too dry to plant seeds or if soil acidity causes harm. For an extended period of time, these seeds do not germinate when planted in soil. It impacts cold resistance, regeneration capability, and yield. Twenty millimeters of productive rapeseed roots need surface-layer taproot moisture before winter germination and early growth may begin. Canola must reach a maximum length of 20 cm and a diameter of at least 0.5 cm before it may be used in the flowering, button-forming, and seed-filling phases. enhanced soil moisture.
For optimal rapeseed production, 45-50 cm of rainfall is required to provide an adequate amount of vegetative moisture. Humidity in the air is crucial for germination and the growth of seedlings, and rapeseed is no exception when it comes to blooming. Fewer flowers and fewer pests are the results of timely soil tillage, fertilization, planting, and sufficient weed management during the blooming period, as well as low temperatures and precipitation. Not to mention the quantity and size of seeds and pods, the kind of soil used for cultivation, and the weather during winter. Sowing under conditions of warm and dry winds affects the attainment of a high and consistent yield. The development of pods would be adversely affected by cropping at this time. Therefore, to prevent illness attacks, rotation should be at least three to four years. Due to a combination of factors, including a drastically reduced flowering period and an abundance of unfertilized cereal and legume flowers, the resulting seeds are small and undernourished, drastically reducing the amount of seed yield.The decreased spring yields are due to the fact that sunflowers and beets are hosts to many economically significant illnesses, and there is a heightened danger of variations in sunflowers, making them unsuitable ancestors. Nematodes are a big issue when it comes to canola production in Bulgaria. Wheat is the most superior crop before. Due to a lack of water, cereals are being removed. Soil needs two irrigations: one for germination and another for blooming; this is because very dry springs and autumns need harvesting from the field early (by mid-August), thus leaving soil with sufficient moisture.reserve areas that are weed-free. Research conducted in Germany The oil content in the seeds of winter oilseed rape cultivated after irrigation is often sufficient, since spring is typically rainy.Harvesting rapeseed after winter wheat yields a 0.9% increase According to Staneva et al. (2007), rapeseed can withstand cooler winter oilseed conditions than wheat-clover or clover mixtures. Rape must be seeded after winter wheat, grain-legumes, and root crops in order for its cultivation to be effective.

ability to withstand cold conditions. Rapeseed should not be planted after cabbage species since that is when it will harden the most.

For 10 days at 5 degrees Celsius and 5 days at -3 degrees Celsius, the plants are in the "rossette" stage. Plants

that have fully matured and hardened may withstand temperatures as low as -15 °C in the absence of snow, and temperatures as low as -25 °C with 5 cm of snow cover. Non-

Soil preparation is crucial for seed germination and early growth (great soil tillage is ideal). The ideal weight for a thousand seeds is 4.5 to 5 grams, and they should have a germination rate of more than 96%. Standard planting depths with poor germination rates include

Even hardy plants wither away between 6 and 8 degrees Celsius. Rape is quite sensitive up to the fourth suggested stage, when weak plants begin to emerge. Certified

a leaflet. While plants in stage 2 of the rapeseed life cycle stop growing in the chilly, humid conditions of early October, plants at stage 1 continue to thrive. Damaged plants take longer to recover from frost in the spring. Early fall and late spring frosts are crucial for rapeseed growth. The extent to which plants are developed, the amount of moisture, and the duration of freezing temperatures determine the temperature that causes damage. Crops are severely damaged by soil that is very damp and by the regular ebb and flow of temperatures. Soils with high moisture may still be damaged by frost as early as -7 to -8 degrees Celsius, even if plants in dry soils don't survive below -160 degrees Celsius. Canola does best between 18 and 20 degrees Celsius for development and growth. The ideal air temperature for blooming and ripening is 23 degrees Celsius.

If the crops are not adequately covered in snow or if the snowfall is too light, the plants grown for rape run the risk of dying during dry and cold spells. On sunny winter days, rape starts to photosynthesise, absorbing and releasing water vapour. Simultaneously, soil temperatures are below average, making it impossible for plants to absorb water; as a result, they die from the cold and the drought (physiological drought). The heavy snowfall is an additional obstacle. After then, snowmelt raises the concentration of carbon dioxide, which smothers vegetation. Root death may occur when soil temperature fluctuates or freezes often.

The extensive root system of rapeseed is its defining feature. In ideal soil conditions, this oilseed crop grows a complex taproot system that includes numerous branches. At the first pair of leaves, the roots are 30–40 cm deep, and after one month, between the fourth and fifth pair of leaves, they are 60–70 cm deep. By the end of button formation, they are 150–180 cm deep, and by maturity, they reach 300 cm.

The best seeds to plant are those that have matured into big, plump, clean seeds. Here are some things to keep in mind while selecting a rapeseed variety: 1. regional circumstances, including weed infestation and weed composition in the planting regions; 2. factors that promote the growth of pests and diseases; 3. anticipated rainfall and its distribution during the growing season; 4. quantities and amplitudes of temperature. Soil needs to acquire the appropriate levels of precepitation in fall, which is why cultivation depth fluctuates between 20 and 25 cm. In order to keep the soil from drying up, which is particularly important in dry summers, cultivation must begin as soon as the preceding crop is harvested. To integrate straw into deep tillage (scuffled stubble), it is necessary to leave it on the surface and bind it with soil. The field's condition dictates how often harrowing and disking should be administered. Soil compaction and the formation of big lumps are two reasons why soil shouldn't be allowed to dry. To prepare the ground for planting rapeseed, it is best to harrow and pack the soil until it is smooth and firm. Seeds germinate more quickly on a solid substrate because water may ascend to them via capillary action.

The best time to plant rapeseed is in the cooler months of August and September.

the time frame of 25.08–15.09 is ideal. Weather conditions during the growing season and the plants' ability

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to put out a rosette of six to eight leaves in the fall determine the exact seeding dates that will ensure their survival through the winter. For optimal seed-to-soil moisture utilization, plant seeds shallowly (no more than 2 cm in dry circumstances and 4 cm in normal conditions) immediately after soil tillage. Geographic considerations play a significant role in determining the best variety or hybrid to use. While several kinds may be cultivated in flat locations, hybrids are better suited for planting in mountainous regions with harsh winters. How much seed should be sown depends

according to the kind of cultivar, whether it a hybrid or a linear variation. Complete harvesting information. Lower yields are the result of higher sowing standards since fewer labels should be attached to the bags containing certified branches and pods. Heavy plant seeds. An excellent germination capacity is 95%. The taller plants are, the more likely it is that linear structures will lodge.

different types Here is the amount of seeds: Fifty seeds in the process of bloomingThe quantity of fertilizer used depends on

on a square meter for early seed (till August); 50–65 per square meter for standard seed (first to tenth September); 70–90 per square meter for late seed (tenth September). Here is the recommended seed amount for hybrid varieties: There should be 40 germinating seeds per square meter for early types, 40–55 for varieties with an intermediate growth period, and 65 for late ones. Planting hybrids at a density of 45–50 plants per m2 and varieties at 60–70 plants per m2 is ideal. Between 12 and 15 centimeters is the recommended spacing between rows for planting. 4.5-8 kg/ha for seed production and 10-12 kg/ha for green mass production, yielding at least 20-30 plants/m2 for the

levels (lack of potassium and magnesium), growth stunt, shortening to of internodes, strong lateral branching of stems, flower formation is to stunted, decrease of pod formation with 20 % (boron insufficiency), etc. epinasty - droop of the flowering tops of peduncles, followed by is from necrosis (calcium insufficiency). Introduction of boron in the soil can 7 % because be done by seed treatment or by leaf fertilization. The optimal norm oilseed crops very of fertilization is 0.3-0.5 kg/ha. Boron may be applied in the form of borax, boric acid, superphosphate, or ammonium nitrate with higher and content of boron. Its introduction leads to increased winter- rapeseed resistance, prevents lengthening of plants, helps the formation of indexs from 3 to 4:1. generative organs. Formation of high yields and resistance to late-spring frost requires sulphur. The ratio between nitrogen and sulphur should be 15:1. When there is sulphur deficiency, the young leaves are reddish, and the corolline leaves are pale yellow to white. Growth processes are stunted and the plant becomes chlorotic; yield in the early hours of the day or late in the evening. It is necessary know the characteristics of the respective variety with regard unfavorable conditions such as lodging, earlier pod dehiscence, The critical moisture content of seeds of the different varieties 8.3 to 8.6 %, but in longer storage humidity should be the seed have high oil content, which, as in all easily oxidates.

The yield is determined by the number of plants (per area per plant) and by 1000 seed weight. For maximum yields, should have leaf area index and pod surface

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Write your paper on normal typing paper (A4, 30 lines per page, 62 characters per line) and send it to the editing office. A complete research article (including abstract, references, tables, figures, and any additional appendices) should not exceed fifteen pages, according to the editors.
The following structure should be followed by the manuscript: Abstract, Title, Authors' names and affiliations, Keyword list, Greetings, Subject Matter, and Materials, Sections: Introduction, Body, Conclusion, Acknowledgements (if applicable), Tables, and Figures.
The title should convey the essence of the study in a succinct and informative manner. The correct way to write it is with tiny letters, bolded 14, and no abbreviations.
Authors' names and institutions Properly citing writers requires beginning with initials of the first names and then moving on to the family names. Up next, you should include the full name and address of the school. Various symbols denote the writers' affiliations. A working email and phone contact for the author should be included as a footnote on the first page for the purpose of correspondence with the editorial board and readers. An asterisk (*) denotes the corresponding author.
No more than 350 words should be used in the abstract. What is new need to be made very clear.

maybe someone else could do the experiment again to make sure the findings are legit.
The evaluation's statistical characteristics are provided with the results in easily digestible tables and figures. The text should not restate the data found in the tables and figures.
Keep tables to a minimum and make them as basic as possible. Make sure you write each table on a different page and give each one a descriptive title. They need to be placed outside the main text with a clear indication of where to put them.
Clear, well-contrasted, and accurately rendered figures are ideal. Materials with graphics should be chosen. All photos must be suitable for printing. Color illustrations are provided as an exception, subject to editorial board approval and, maybe, additional expenses. You should save the figures in a single file and reference their locations in the text.
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Final Thoughts: A few well-chosen lines should capture the essence of the research's most significant implications for both theory and practice. There should be no usage of new paragraphs or numbered conclusions. Conclusions revolve around contributions.
Works Cited:

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Pieces published in scholarly journals: last name(s), initial(s), and year. The journal's full title, volume, and page numbers. Such as in the 2002 study by Simm, Lewis, Grundy, and Dingwall. The effects of natural selection on sheep's body composition. Volume 74, Issues 39–50, Journal of Animal Science
Literature: Last name(s) and initials of the author(s), publication year. Edition, title, publisher, and publication date. Case in point: Oldenbroek JK (1999). A second edition of Genebanks and the preservation of genetic resources from domesticated animals. Animal Science and Health Institute DLO, Netherlands.
Section of a book or proceedings from a conference: Author(s) last name(s), initial(s), year. Book or proceedings title, volume, pages edited by (or on behalf of) the editor(s). Who published it and where was it published? For instance, in 1995, Mauff, Pulverer, Operkuch, Hummel, and Hidden published a paper. Different C3-variants and phenotypes of converted and unconverted C3. Included in: Provides of the Biological Fluids (vol. 22, 143-165), Oxford, UK: Pergamon Press, edited by H. Peters. J. Mitev and N. Todorov, 1995. Impact of dry-season food intake and body-conditioning index on fertility

discoveries have been made across

