

ДАТА ЗВІТУ: 2020-07-07 15:18:57

**ЗАГОЛОВОК:**

Використання регуляторів росту при вирощуванні Sinapis alba в умовах Сумської області.doc

**АВТОР:**

Лі Джіавей

**НАУКОВИЙ КЕРІВНИК:**

Мельник А.В.

**ПІДРОЗДІЛ:**

SNAU

**ДАТА ЗАВАНТАЖЕННЯ ФАЙЛУ:**

2020-07-07 15:13:38

**ПРОПУЩЕНІ ВЕБ-СТОРІНКИ:** ⓘ**Обсяг знайдених подібностей**

Зверніть увагу, що високі значення коефіцієнта не автоматично означають плагіат. Звіт має аналізувати компетентна / уповноважена особа.

**Перелік можливих спроб маніпуляцій з текстом**

У цьому розділі Ви можете знайти інформацію щодо модифікації тексту, яка може бути спрямована на зміну результатів аналізу. Невидимі для особи, яка оцінює вміст документа у роздруковці чи файлі, вони впливають на фрази, порівнювані під час аналізу тексту (викликаючи передбачувані помилки), щоб приховати запозичення, а також підробити значення у звіті про подібність. Слід оцінити, чи є модифікації навмисними чи ні.

Заміна букв <small>кількість символів з інших алфавітів може означати спробу обману, уважно перевірте!</small>	1	показати в тексті
Інтервали <small>кількість збільшених відстаней між літерами - будь ласка, перевірте, чи вони імітують пробіли, викликаючи приєднання слів до звіту</small>	58	показати в тексті
Мікропробіли <small>кількість пробілів із нульовою довжиною - будь ласка, перевірте, чи вони розміщені всередині слів та спричинили поділ слів у тексті</small>	3	показати в тексті
Білі знаки <small>кількість символів з білим кольором шрифту - будь ласка, перевірте, чи використовуються вони замість пробілів, викликаючи приєднання слова (у звіті колір літер змінено на чорний, щоб показати їх)</small>	0	показати в тексті

**Подібності за списком джерел**

Прокручіть список та аналізуйте, особливо, фрагменти, які перевищують КП 2 (позначено жирним шрифтом). Скористайтеся посиланням "Позначити фрагмент" та перегляньте, чи є вони короткими фразами, розкиданими в документі (випадкові схожості), численними короткими фразами поруч з іншими (мозаїчний плагіат) або великими фрагментами без зазначення джерела (прямий плагіат).

**10 найдовших фраз (7,63 %)**

Десять найдовших фрагментів знайдених у всіх доступних ресурсах.

ПОРЯДКОВИЙ НОМЕР	НАЗВА ТА АДРЕСА ДЖЕРЕЛА URL (НАЗВА БАЗИ)	АВТОР	КІЛЬКІСТЬ ІДЕНТИЧНИХ СЛІВ		<a href="#">ВИДАЛИТИ ВСІ ПОЗНАЧКИ</a>
1	Вплив передпосівної обробки насіння Brassica juncea L. Gzern в умовах Сумської області. <i>Sumy National Agrarian University (SNAU)</i>	Лі Жуйцзе	121	1,30 %	показати в тексті
2	Вплив передпосівної обробки насіння Brassica juncea L. Gzern в умовах Сумської області. <i>Sumy National Agrarian University (SNAU)</i>	Лі Жуйцзе	94	1,01 %	показати в тексті
3	Вплив передпосівної обробки насіння Brassica juncea L. Gzern в умовах Сумської області. <i>Sumy National Agrarian University (SNAU)</i>	Лі Жуйцзе	87	0,94 %	показати в тексті
4	Вплив передпосівної обробки насіння Brassica juncea L. Gzern в умовах Сумської області. <i>Sumy National Agrarian University (SNAU)</i>	Лі Жуйцзе	77	0,83 %	показати в тексті

	області. <i>Sumy National Agrarian University (SNAU)</i>			%	<a href="#">тексті</a>
5	Вплив передпосівної обробки насіння Brassica juncea L. Gzern в умовах Сумської області. <i>Sumy National Agrarian University (SNAU)</i>	Лі Жуйцзе	66	0,71 %	<a href="#">показати в тексті</a>
6	Вплив передпосівної обробки насіння Brassica juncea L. Gzern в умовах Сумської області. <i>Sumy National Agrarian University (SNAU)</i>	Лі Жуйцзе	63	0,68 %	<a href="#">показати в тексті</a>
7	Вплив передпосівної обробки насіння Brassica juncea L. Gzern в умовах Сумської області. <i>Sumy National Agrarian University (SNAU)</i>	Лі Жуйцзе	53	0,57 %	<a href="#">показати в тексті</a>
8	Вплив передпосівної обробки насіння Brassica juncea L. Gzern в умовах Сумської області. <i>Sumy National Agrarian University (SNAU)</i>	Лі Жуйцзе	51	0,55 %	<a href="#">показати в тексті</a>
9	Вплив передпосівної обробки насіння Brassica juncea L. Gzern в умовах Сумської області. <i>Sumy National Agrarian University (SNAU)</i>	Лі Жуйцзе	50	0,54 %	<a href="#">показати в тексті</a>
10	Вплив передпосівної обробки насіння Brassica juncea L. Gzern в умовах Сумської області. <i>Sumy National Agrarian University (SNAU)</i>	Лі Жуйцзе	47	0,51 %	<a href="#">показати в тексті</a>

### з бази даних RefBooks (0,15 %)

Всі фрагменти знаходяться в базі даних RefBooks, яка містить більше 3 мільйонів наукових публікацій.

ПОРЯДКОВИЙ НОМЕР	ЗАГОЛОВОК	АВТОР	КІЛЬКІСТЬ ІДЕНТИЧНИХ СЛІВ (КІЛЬКІСТЬ ФРАГМЕНТІВ)	ВИДАЛИТИ ВСІ ПОЗНАЧКИ
<i>джерело: Paperity</i>				
1	Guest Editorial: Visual Multimedia Learning from Big Surveillance Data	(A. Kanatsuka; )	14 (2)	0,15 % <a href="#">показати в тексті</a>

### з домашньої бази даних (17,86 %)

Всі фрагменти знайдені у внутрішній базі даних вашої установи.

ПОРЯДКОВИЙ НОМЕР	ЗАГОЛОВОК	АВТОР	ДАТА ІНДЕКСАЦІЇ (АРХІВАЦІЇ)	КІЛЬКІСТЬ ІДЕНТИЧНИХ СЛІВ (ФРАГМЕНТІВ)	ВИДАЛИТИ ВСІ ПОЗНАЧКИ
1	<b>Вплив передпосівної обробки насіння Brassica juncea L. Gzern в умовах Сумської області.</b> <i>Sumy National Agrarian University (SNAU)</i>	Лі Жуйцзе	2020-06-19	1 660 (76)	17,86 % <a href="#">показати в тексті</a>

### з програми обміну базами даних (0,00 %)

Всі фрагменти знайдені в базі даних інших установ.

ПОРЯДКОВИЙ НОМЕР	ЗАГОЛОВОК НАЗВА БАЗИ ДАНИХ	АВТОР	ДАТА ІНДЕКСАЦІЇ (АРХІВАЦІЇ)	КІЛЬКІСТЬ ІДЕНТИЧНИХ СЛІВ (КІЛЬКІСТЬ ФРАГМЕНТІВ)	ВИДАЛИТИ ВСІ ПОЗНАЧКИ
<i>НЕМАЄ ПОДІБНОСТЕЙ</i>					

### з Інтернету (0,09 %)

Всі фрагменти, які були знайдені у відкритому доступі глобальних інтернет-ресурсів.

ПОРЯДКОВИЙ НОМЕР	ДЖЕРЕЛО URL	КІЛЬКІСТЬ ІДЕНТИЧНИХ СЛІВ (ФРАГМЕНТІВ)	ВИДАЛИТИ ВСІ ПОЗНАЧКИ
1	<a href="http://journals.urau.ua/pbsd/article/download/120444/115428">http://journals.urau.ua/pbsd/article/download/120444/115428</a>	8 (1)	0,09 % <a href="#">показати в тексті</a>

## Вміст пошуку - позначення подібності:

Будь ласка, зверніть увагу на те, що система не дає остаточної оцінки. Якщо виникають підозри, Звіт Подібності повинен бути переданий на ретельний аналіз.

#### ВИДИ ДЖЕРЕЛ І ТИПИ МАНІПУЛЯЦІЙ

■ - База даних університету ■ - Джерело Інтернет ■ - База даних RefBooks ■ - Цитати  - Заміна букв

 - Інтервали  - Мікропробіли

THESIS

Degree - Master

on: «The use of growth regulators in the cultivation of Sinapis alba within Sumy region conditions»

Completed: student of  
Li Jiawei

**Supervisor Andrii Melnyk**

**Doctor of Agricultural Sciences, Professor, Academician of the Academy of Sciences of Higher School of Ukraine**

**Reviewer**

**Sumy- 2020**

**SUMY NATIONAL AGRARIAN UNIVERSITY**

**Faculty**

**Department Department of Horticulture and Forestry**

**Education degree «Master»**

**Specialty**

**Approved:**

Head of Department Cand. **biol. Sc., Ass. Professor T. I. Melnyk**

« » **2020**

TASK

on thesis for student

Li Jiawei

1. Theme of Thesis: Features of the growth regulators of mustard white cultivation technology

**Supervisor Doctor of Agricultural Sciences, Professor Andrii Melnyk**  
**approved by the university from December, 11 2018 No 3445- H**

**2. Deadline for student completed project (work) 20.06.2020**

**3. Background to the project (work): information materials, laboratory and field research, results of statistical analysis**

**4. Contents of settlement and explanatory notes (the list of issues to develop):**

-Effect of treatment seeds and foliar fertilizer **on morphological parameters of mustard white**; -Effect of treatment seeds and foliar fertilizer **on chlorophyll content of mustard white**; - Effect of treatment seeds and foliar fertilizer on productivity of mustard white; - Effect of treatment seeds and foliar fertilizer on yield of **mustard white**

**5. Date of assignment December, 11, 2018**

**PLAN**

**No Title the stages of the degree project (work) Date of performance project stages Note**

**1 Definition of the** theme of the thesis **March, 2019 Done**

**2 Approval of the topic March, 2019 Done**

**3 Determination of the thesis plan and agreement with the scientific supervisor April, 2019 Done**

**4 Selection and analysis of literary sources on the** topic of thesis **April, 2019 Done**

**5 Selection of research methods May 2019 Done**

**6 Formation of the program of pre-diploma practice based on the theme of the thesis May- November 2019 Done**

**7 Laying an experiment /An analysis of the current state of the research area December 2019 Done**

**8 Collection of primary data /Field studies June- September, 2019 Done**

**9 Mathematical treatment of research results /Data processing of research results on a computer May, 2020 Done**

**10 Report on pre-diploma practice-as the basis for Writing an experimental part of the thesis master May, 2020 Done**

**11 Testing the results of the study June,1, 2020 Done**

**12 Completion of the project part of the thesis, design chapters June, 2020 Done**

**13 Processing of comments of the supervisor June, 2020 Done**

**14 Review the thesis June, 2020 Done**

**15 Preparation of the report and presentations for the thesis June, 30, 2020 Done**

**16 Defending the thesis July,09, 2020 Done**

Student Li Jiawei

(signature)

Supervisor of science work Melnyk **A.V. Zherdetska S.V.**

( signature)

**Checking the authenticity conducted. Thesis allowed to protect**

## CONTENT

Preface .....	5
<b>CHAPTER 1. REVIEW OF RESEARCH LITERATURE.....</b>	<b>7</b>
1.1. Conditions of Ukraine.....	7
1.2. Morphological and biological characteristics of White mustard.....	9
1.3. Cultivation techniques of White mustard	11
<b>CHAPTER 2. CONDITIONS, MATERIAL AND METHODOLOGY OF RESEARCH.....</b>	<b>13</b>
2.1. Soil and climatic conditions of research.....	19
2.2. Object, scheme and methods of research.....	15
<b>CHAPTER 3. RESULTS OF THE RESEARCH.....</b>	<b>19</b>
3.1. Effect of plant growth regulator on leaf of Mustard.....	19
3.2. <b>Effect of plant growth regulator on the yield</b> of mustard.....	20
3.3. Occupational Health.....	24
3.4. Environmental Impact Assessment.....	23
Conclusion .....	29
Reference .....	30
Appendixes .....	33

### Preface

There is an old saying in China, "food **is the most important thing for the** people, and food **is the most important thing for** them. Material is the basis of everything, people's material basis is very important, food safety as the main emphasis on food safety. Everyone's life and work in the world is based on the premise of food, clothing and warmth; Without enough to eat, productivity will be low and people will not be able to live and work. Nowadays, in order to let thousands of people do not worry about eating, it is particularly important to improve the per mu yield, how to use the limited land resources, to let the per mu yield to achieve double growth, is everyone's common desire.

Rapeseed (referred to as rapeseed in agronomy) is a cruciferous plant. Currently, rapeseed is mainly cultivated as follows: Cabbage type rapeseed (*Brassica rapa campestris* L), Mustard type rape (*Brassica juncea* L.), *Brassica napus* (*Brassica napus* L.). Rapeseed generally grows in relatively humid climates, such as southern China. Rape also has many USES, such as the rape flower in the bud can be eaten; Rape is also a beautiful scenery when in full bloom (Han Zhong city, Shaanxi province, China, has a rape sightseeing area); After the flowers have faded, rapeseed can be pressed for oil. Rape is rich in vitamins, minerals can promote bone development, accelerate the metabolism of the human body and enhance the hematopoietic function; Contains carotene, niacin and other nutrients are also important to maintain life activities [1].

Scientific use of plant growth regulators and micronutrient fertilizer can greatly improve the yield of rape, cost less, high efficiency [2]. The most common way to increase rapeseed yield is to apply fertilizers to provide the plant with the nutrients it needs. In addition, spraying foliage fertilizers, plant hormones, and treating seeds in advance are also necessary to promote plant growth and development.

Nutrients can be absorbed by crops in two ways: one is root absorption, and the other is leaf absorption [3]. The technique of applying fertilizer directly to the surface of nutrients outside the root system of a crop is called out of the root fertilization, often called leaf fertilization [4]. Foliar fertilization has the advantages of strong pertinence, fast absorption, good effect, little risk of environmental pollution, simple application method and economy [5]. In recent years, with the development of fertilization technology, foliar fertilization has been rapidly popularized and applied as a fertilization measure to supplement crop nutrition and prevent the occurrence of vegetable deficiency [6].

Foliar fertilizer [7], as an auxiliary fertilization method, has direct nutrient supply. Fixed, prevent soil nutrient management, fertilizer efficiency, etc, it is rich in nitrogen, phosphorus, potassium and boron, zinc and other trace elements, spraying on the leaf in rapeseed, can make up for a lack of rhizosphere absorb nutrients, prevent to take off the fat premature aging, rape podding number, grain full, reach the purpose of production, income, savings, efficiency [8].

Plant hormones play an important regulatory role in plant growth, development and yield formation. For example, auxin produced at the top of plants or applied exogenously can transfer the nutrients needed for plant growth to the parts where auxin is produced or applied, promote the absorption of mineral nutrients, and inhibit the growth of lateral buds [9]. Baidiansha-maimaitieliet al [10] found that applying auxin after topping cotton field production could slow down the occurrence of premature aging of cotton leaves and increase the yield. Cytokinin 6-BA can induce flower bud differentiation, promote lateral bud development and branch growth, promote the formation of chlorophyll precursor (Aminolevulinic acid, ALA) and the accumulation of chlorophyll [11], delay the aging of organs, reduce the loss, and improve the setting rate and fruit setting rate. White mustard (*Sinapis alba* L.) is a member of the large family of cruciferae.

The growth and development of white mustard can be promoted by applying the growth regulator on the leaf surface timely and reasonably during the growth and development of mustard. A research was conducted in Sumy (Northeastern part of the Forest-steppe), Ukraine, in 2019 to explore the specific effects of different types of modulators.

## CHAPTER 1 REVIEW OF RESEARCH LITERATURE

### 1.1. Conditions of Ukraine Geographical location of Ukraine

Ukraine is located in eastern Europe, between 44 ° and 52 ° north latitude, in the southwestern part of the Former Soviet Union in Europe. It borders Russia to the northeast and east, Belarus to the north, Poland, Czechoslovakia, Hungary, Romania and Moldova to the west and southwest, the black sea and the sea of Azov to the south, and Turkey across the sea. Ukraine has a vast territory of 603,700 square kilometers, stretching 1,300 kilometers from east to west and 900 kilometers from north to south [12].

The terrain. Most of Ukraine is plain and hilly. The plain covers 95% of the country, with an average height of 175 meters above sea level. The highest point of the plain is the Khotyn Plateau, which is 5,151 meters above sea level.

The lowest point of the plain is the coast of the black sea and sea of Azov, which is 2 meters above sea level. Plains can be divided into highlands and lowlands. The highland area is mainly located on the right bank of the Dnieper River. There are uplands along the Tiber River, Podolier Uplands and Warren Uplands. In the eastern part of Ukraine, there are the southwest branch of the central Russian plateau, the Donetsk plateau and the plateau along the Azov sea. The highlands make up 25% of the country. The lowlands are mainly in the north, central and south. The famous plesiyie lowlands, the black sea coastal lowlands and the Dnieper river coastal lowlands, lowlands account for 70 % of the land area. The western part of Ukraine is mountainous, mainly the Carpathians, and in the south, there are the Crimean Mountains. The mountainous area accounts for only 5 % of the country.

Mountains, plains, highlands and lowlands, waters. The main mountains in Ukraine are the Ukrainian Carpathian mountains, which are located in western Ukraine, with an average altitude of 1,000 meters above sea level and a peak of 2,061 meters. Stretching 270 km from north to south, it is more than 100 km wide (the Carpathian mountains of Ukraine are part of the Carpathian mountains of Europe). Located at the southernmost tip of Ukraine, the Crimean mountains stretch 180 kilometers along the southern shore of the Crimean peninsula, 50 kilometers wide, and are generally 500-1,000 meters above sea level. The plains of Ukraine are divided into high plains and low plains. The high plains include the warren plateau, the podolye plateau, the Dnieper river plateau, the donetsk plateau, the Azov sea plateau and the central Russian plateau. The upland plains make up 25% of the total land area. The lowlands include the bolesiye lowlands, the Dnieper lowlands and the black sea lowlands. Lowlands make up 70 percent of the country's total land area.

There are 116 rivers more than 100 kilometers in Ukraine, the longest of which is the Dnieper river, which runs 981 kilometers through Ukraine. Others are the Nambuga River, Transnistria River, North Donetsk River, Prut River, Danube River (part of the mouth) and so on. There are more than 3,000 natural lakes in Ukraine, the largest of which is Dnestrovsky Lake with an area of 360 square kilometers, and the deepest of which is Svegaskoye Lake with a depth of 58.4 meters.

There are 899 reservoirs built in Ukraine with a total area of 96.35 hectares and a total storage capacity of 51.7 cubic kilometers. There are 899 reservoirs built in Ukraine with a total area of 96.35 hectares and a total storage capacity of 51.7 cubic kilometers.

The soil. There are more than 1200 kinds of soil in Ukraine. Agricultural soils can be divided into the following zones: [12].

The Polissier area: total area 11.3 million hectares, accounting for 19% of the total land area. The soil is very complex, 50 % of which is grass soil and podzolic soil.

Forest and grassland areas: the total area is 20.2 million hectares, accounting for 34% of the total land area and over 37% of the cultivated land area. The black - gray forest soil accounts for 21% and the typical black soil 51 %.

Grassland area: the total area is 23 million hectares, accounting for 38% of the total land area. This zone is basically black soil, among which, under the northern climatic conditions, the general black soil accounts for 64% of the cultivated land area in this zone, and the black soil under the southern climatic conditions accounts for 23%. The vast area of black soil makes Ukraine one of the three largest black soil belts in the world.

Arid grassland area: it occupies about 3% of the total land area. The main soil is millet colored soil. Among them, the deep millet colored saline soil occupies 78% of the cultivated land area in this area. In the mountains of the Carpathian Mountains of Ukraine and the mountains of the south of Crimea: the soil types are significantly different according to the vertical height of the land type. The lower part of the mountains is generally black humus soil, which is generally grassland and brown soil in the plateau area, acidic brown soil or grass-soil brown soil in the mountainous areas, and the top of the mountains is generally submerged soil.

Climatic conditions

Ukraine lies between the maritime climate and the continental climate, and the southern part of the Crimean Peninsula has a subtropical climate.

Average temperature: - 7 °C in the northeast in January; In July, it is 18 ~ 19 °C in the northwest and 23 ~ 24 °C in the southeast. Precipitation is 300 mm in the southeast and 600 ~ 700 mm in the northwest, mainly concentrated in June and July.

1.2. Morphological and biological characteristics of white mustard (*Sinapis alba* L.).

Perennial or biennial white princess, Cruciferae, seeds globular, grayish- white to yellowish, seed coat thin and brittle, oily. No smell, spicy taste [13].

Morphological characteristics. Herbs one or two years old, stems stout, up to 1 m tall [14], all sparsely hairy. Leaves basal with long stalks, leaves broad, obovate 10~15 centimeters long and more than 5 at its widest point, Piano-like deep or nearly complete split, lobes 5~7, apex large, descending gradually smaller; Leaves with short stalks, leaves smaller, lobes finer; Leaves of inflorescence often rarely lobed. Racemes, flowers terminal; Florets about 1 cm long; Calyx, green, erect; Corolla yellow, oblong ovate, with erect long claws at base; Stamens 6, 4 filaments longer; Ovary oblong, style slender, stigma small [13].

Lonicera broadly linear, 2~3 cm long, densely covered with coarse white hairs, often with shallow constricted seed parts, apex with beak, beak without seeds, smooth glabrous. Seeds rounded, yellowish white, 1.5~2 mm in diameter. Flowering from April to June. The fruit period is from June to August.

Biological characteristics. White princess for warm, drought - resistant crops [15]. The seed has high oil content and the starting temperature of germination is 10 °C. When the temperature is about 15 °C and the soil water content is about 80 %, the seed can germinate in 5~7 days. The optimum temperature of early vegetative growth was 15~20 °C, and that of late reproductive growth was 25~27 °C. Flowering period is relatively long, autumn sowing for march to April, pod stage may on, in the middle. White princess has wide adaptability and strong resistance to stress. Purple soil and sandy loam are the most suitable for wide soil. Pod is sensitive to boron because it is closely related to the boron content of soil [16].

Distribution range. Originated in Europe, in China's Anhui, Henan, Sichuan, Shandong and other places around the introduction of culture.

Application value. White princess seeds for medicinal purposes, expectorant, cold, swelling analgesic effect; Whole grass can be used as fodder.

Antibacterial effect: The benzyl isothiocyanate contained has a broad-spectrum antibacterial effect, and it has antibacterial effects on yeasts, 20 fungi and dozens of other strains. White mustard seed water infusion has different degrees of antifungal effects in test tubes. Aglycoside hydrolysis produces aglycone mustard oil also has bactericidal effect.

Stimulation: White Glucosinolates, which has no stimulating effect [17], the volatile oil (white mustard oil) is produced by the action of Mustardase after encountering water. Allyl isothiocyanate, the main component of mustard oil, has a pungent and spicy taste and a stimulating effect. Can make the skin red, warm, and even cause blisters.

Important oil crop [18], seed oil content is 33~50 %. It also produces rapeseed meal. The protein content of the

cake is up to 40 %, the amino acid composition of the rapeseed protein is reasonable, and its lysine content is similar to that of soybean, while the content of lysine, methionine and other sulfur-containing amino acids is higher than that of soybean protein [19]. Rape in addition to used for extracting edible oil and feed, in the food industry can also make margarine, artificial protein. It is also widely used in metallurgy, machinery, rubber, chemical industry, paint, textile, soap making, paper making, leather and medicine and has important economic value [20].

### 1.3. Cultivation techniques of White mustard

White princess is an annual or biennial herb with a height of about 1 meter. White princess likes to grow in a sunny, warm environment, but that doesn't mean it can't grow in a sheltered environment, white princess is also good at cold and heat tolerance, so growers don't take temperature into account when planting white princess seeds. And it does not require high soil quality, in poor or saline soil are able to grow normally [21]. In a word, the adaptability of white princess to the environment is relatively strong, easy to cultivate.

Planting method: seed propagation, spring sowing or autumn sowing [22]. Before sowing, soak the seeds in 15 % salt water for 20 min, or soak them in warm water at 30 °C for 2 ~ 4h. Remove and let dry slightly. Mix multiple amounts of fine soil, drill, covering soil 10cm, a little repression, watering.

Seedlings emerged about 10-15d after sowing, seedling height about 15cm thinning, plant spacing 10-15cm, after seedling was determined, topdressing once, and carry on watering, watering frequency depends on soil wet degree and decide. Excessive nitrogen fertilizer should be avoided during growth to prevent the growth of branches and leaves and affect the yield.

## 1 CHAPTER 2

### CONDITIONS, MATERIAL AND METHODS OF CONDUCTING RESEARCHES

Field researches were conducted at the research field of NNVK (educational- scientific- **production complex**) of **Sumy National Agrarian University during 2019-2020**. Ukraine. Research areas of Sumy NAU are within the city. Sumy ( **50° 52.742' N latitude, 34° 46.159' E longitude and 137.7 m above sea level**) and belong to the **north-eastern part of the forest-steppe**.

Scientific and research work is carried out on the tasks of **thematic plans and within the** framework of State **scientific topics: Sumy National Agrarian University «of elements of mustard growing technology in the conditions of north-eastern forest-steppe of Ukraine»**, State registration number **0115U001051**.

#### 2.1. Soil and climatic conditions of researches

Zone Northeast Forest- **favorable for normal growth and development of spring plants. In particular, sufficiently high soil fertility, their satisfactory water and air permeability, sufficient rainfall and temperature regime.** Soil description - chernozem **typical deep medium-humus coarse-** grained- medium-alumina on the loamy rocks. The humus content by Tulle **4.1 - 4.5 %; PH Salt 6.0 - 6.2. The content of highly hydrolyzed nitrogen f according to Cornfield is 120 mg/kg, of moving compounds of P2O5 and K2O by Chirikov - 202 mg/kg and 85 mg/kg respectively.** A selection of soil was conducted directly on the research site and its agrochemical analysis was carried out.

The **climate of the north-eastern forest-steppe is temperate-continental.** The beginning of winter from mid-**November. The weather during this period is very erratic, frosts are replaced by warming, snow - rain.** Since mid-**December set snow cover**, which until February **has a height of 20-35 cm. The average temperature of the coldest month (January) minus 7-8 °C** [23]. **Winter in the Sumy region is unstable: cold periods up to 20 °C frost can change short-term thaw.** In this case, **the air temperature can increase to + 4 °C, + 5 °C heat, and snow in the fields can disappear completely.** Since late March fix **the beginning of spring. The beginning of summer in the zone falls in mid-May. Summer is moderately warm. The warmest month is July. Its average daily temperature in the North + 18.6 °C, in the South 20 °C. In summer the air temperature can rise to + 32°C , + 37 °C** [24].

**The average annual rainfall on the region varies within 510- 590 mm, a greater half of precipitation (about 60%) Falls in the warmer months. The rainiest month is July (60-80 mm), less total precipitation falls in February (25-30 mm).**

**The growing season in 2019 was characterized by high temperature and insufficient rainfall for all months, the hydrothermal coefficient of the conditions of the growing season is very arid (SCC = 0.42).**

In April and May rainfall was less than the average perennial indicators on **16.1 and 13.3 mm respectively. In July, fell precipitation is less than 18.6 mm. The largest moisture deficit was observed in July and August, fell precipitation is less than 50.2 and 52.5 mm respectively.**

**Fig. 2.1 Deviation from the average perennial data of temperatures and rainfall ( 2019 year)**

**The air temperature exceeded the long-term indicators in April and June by 2.0 and 2.4 °C. In July and August, the air temperature was larger by 0.9 and 2.3 °C. Most temperature figures exceeded the average annual data in May - at 4.2°C. The sum of positive temperatures for the period of analysis was 2902.2°C, sum of active temperatures - 2825.0 °C, amount of precipitation - 143.3 mm.**

So, for the north-eastern steppes of Ukraine, the **following adverse climatic phenomena** are typical: droughts, droughts, squat winds, **ice, etc. The most dangerous phenomenon is drought. Great damage causing frost in the spring - morning and evening air temperature decrease below 0 °C at positive temperatures** in the daytime.

#### 2.2. Object, diagram and methodology of conducting researches.

**Object of study - the process of optimizing the formation of productivity of white princess depending on the species characteristics, seed treatment with growth regulators and weather conditions.**

The subject of study - white princess (*Sinapis alba* L.) of Seeds treatment, Foliar treatment;

Seeds+Foliar treatment, **types of growth regulators for seed treatment (Albit, Vermistim D, Antistress, Agrinos, Regoplan, Biofoge, Stimulate, Fast start), weather conditions, economical and energy efficiency of the investigated growing technology elements.**

White princess. The vegetation period is **90- 100 days. Plant height 75-100 cm (depending on weather conditions).** Weight: **1000 pills 4.1 - 4.5g.** The seed oil content is 33% ~ 50%. The potential yield is 3.4 t/ha. A sleeveless mustard variety with an erucic acid content of 0.0-1.0 %, used for cooking oil and mustard powder.

These plants are resistant to plant lodging and seed shedding, and are moderately resistant to pests and diseases. Technically, it is suitable for mechanized cultivation. It is recommended to grow **in the steppe and steppe areas of Ukraine. It has a clear morphological mark - the leaves and stems of the plant have strong waxy spots.** The ranking has been registered in the National Grade register in 2014 and is suitable for issuance in Ukraine [25].

On the subject of **Master's work** conducted **field research according to the following scheme.**

**The scheme of the experiment. Factor A - White princess variety -Seeds treatment, Foliar treatment; Seeds + Foliar treatment; factor B - control (without fertilizers); Regulators, Albit, Vermistim D, Antistress, Agrinos,**

Regoplan, Biofoge, Stimulate, Fast start.

Experiment parameters 1:  $l_a = 4$ ,  $l_b = 4$ ;  $n = 4$ , the area of the accounting area of 15 m<sup>2</sup>. The plots are arranged by the method of organized repetitions in four tiers.

During the research, mustard cultivation technologies were generally accepted for the research area, except for the elements studied [26, 27]. The predecessor are grain-cereals. Method of sowing - string with spacing of 15 cm. The seeding rate is 1.5 million pieces seeds per hectare.

Mustard seedlings against cabbage fleas were sprayed with Fastak, 10% kE (0.1-0.15 l/ha), and rapeseed leafhopper, cabbage white caterpillars - Decis (Stefesin, 0.3 l/ha), or F ' Yuri (0.1 l/ha) [28]. Glisol (4-6 kg / ha) or butizan 400 (1.75-2.5 kg/ha) are used to control weeds [29].

Field experiments were conducted in accordance with the field research methodology for Dospethovym and Moisenchenko [30, 31]. Phenological observation of the growth and development of plants of oilseeds of Brassicaceae family was conducted in accordance with the " Methods of State varietal testing of crops [ 32].

Measurements were carried out on the onset of phases of development: rosette, budding, complete flowering, the formation of pods.

Determination of linear growth dynamics carried out on pre-marked plants. Determination of leaf area was performed by the method of " cuts " [33], which is based on determining the area and weight of 50 cuttings, as well as the mass of the leaf surface of the entire sample in the laboratory on cut plants and subsequent calculations by the formula.

, where

**S** - total area of leaves, cm<sup>2</sup>;

**S1** - Area of one carving, cm<sup>2</sup>; **P** - total mass of leaves, g;

**P1** - Weight of Bran, g;

**n** - Number of Bran, pc.

The content of chlorophyll in the leaves determined by making the solution in an alcohol extract with the subsequent determination on the Spectrophotometer ULAB 102 [34]. The laboratory similarity, the mass of 1000 seeds - according to DSTU 4138-2002 [ 35]. The accounting of the harvest was performed entirely from each accounting site.

The elements of the harvest structure determined by the " Method of state varietal testing of crops "[32].

To determine the structure of the crop and chemical analysis of white prinecess seeds from each variation, the test was selected for two model sheaves, which contained typical plants for the variant, and dried them to the air- dry state. Thus, counted the number of fruit branches and order, the number of pods per plant, the number of seeds in the pod, the total seed plant performance.

Analysis of the harvest structure was carried out by the " methodology of state varietal testing of agricultural crops ". The collection of culture was carried out on a separative direct combine in the period when the color of the main stem and the pods was yellow, and the leaves were stripped, while weighing the seeds in variants of the experiment and sampling for determination of moisture and purity. The crop has proved to 100% purity and 10% moisture seeds. The oil- content installed on the Infrared Analyzer Sup Nir 2750 [ 36].

Statistical analysis of research results was carried out by means of dispersive, correlation and regression analysis using computer programs Excel, Statistica-10 [37, 38].

The economic estimation of the investigated factors was carried out by the method of determination of economic efficiency in agriculture at prices, which were formed on October, 2018 determined expenses on 1 hectare, cost of 1 ton of seeds, net profit and level of Profitability [39]. Energy valuation was carried out by A. K. Medvedovsky techniques and P. I. Ivanenko et al. [40].

## CHAPTER 3

### RESULTS OF THE RESEARCH

#### 3.1. Effect of plant growth regulator on leaf of Mustard

Photosynthesis is the process by which green plants, through their chloroplasts, convert light into chemical energy from carbon dioxide and water, store it in organic matter, and release oxygen. The first step in photosynthesis is the absorption of light energy by chlorophyll and the ionization of chlorophyll. The chemical energy produced is temporarily stored in adenosine triphosphate (ATP), which eventually converts carbon dioxide and water into carbohydrates and oxygen.

The main component of chlorophyll is nitrogen, which is consumed by photosynthesis, but transported through the petiole. The detection of nitrogen content in the leaves will prove the content and activity of chlorophyll.

Table 1

Effects of different plant growth regulators on chlorophyll of mustard White prinecess under different treatments

Factor A Factor B The content of chlorophylls "a" and " b" in the plant material in fresh weight, mg/g n-tester

treatment seeds Control 1.35 44.08

Albit 1.44 48.25

Antistress 1.50 45.20

Agrinos 1.48 43.85

Biofoge 1.54 51.25

Fast Start 1.55 46.75

Regoplan 1.60 47.15

Stimulate 1.63 47.05

Vermistim D 1.67 49.30

Average of treatment seeds 1.55 47.35

foliar Albit 1.50 48.20

Antistress 1.61 45.10

Continuation of table 1

Agrinos 1.50 45.40

Biofoge 1.53 47.50

Fast Start 1.23 43.60

Regoplan 1.34 48.10

Stimulate 1.52 43.60

Vermistim D 1.35 52.80  
 Average of treatment foliar 1.45 46.79  
 seeds + foliar Albit 1.17 49.70  
 Antistress 1.54 51.80  
 Agrinos 1.40 42.40  
 Biofoge 1.57 46.70  
 Fast Start 1.40 50.60  
 Regoplan 1.62 44.20  
 Stimulate 1.46 55.60  
 Vermistim D 1.32 50.00  
 Average of treatment seeds + foliar 1.44 48.88

In table 1 seeds + foliar treatment use Stimulate, n-tester is the highest 55.60. Treatment seeds use Vermistim D, Chlorophyll A and C are the highest 1.67 mg/g.

3.2. Effect of plant growth regulator on the yield of mustard

Plant height, **defined as the distance from the base of the plant to the top of the main stem, is one of the most basic** indexes in plant morphological investigation. If the plant height is too high and the plant is too low and short, the yield of the plant will decrease. Therefore, the plant height should be moderate and the stem stout and suitable growth regulator should be applied.

Stem branching is a common phenomenon that increases the size of the plant, making full use of sunlight and external materials and facilitating reproduction of new generations. The number of branches of the plant determines the fruit yield in the later period.

As the plant matures, the number of pods affects seed production. In table 2 Foliar treatment use Fast Start, Height plant is the highest 119.00 cm. Seeds treatment use Biofoge, Quantity branches in one plant is the highest 6.60. Treatment foliar use Stimulate, Number of pods is the highest 243.70.

Table 2

Effects of different plant growth regulators on the morphology of mustard White princess under different treatments

**Factor A Factor B Height plant, cm Quantity branches in one plant Number of pods**

Treatment seeds Control	107.70	5.78	113.95
<b>Albit</b>	113.55	6.20	111.85
<b>Antistress</b>	107.65	6.10	136.60
<b>Agrinos</b>	111.60	6.25	124.95
<b>Biofoge</b>	105.30	6.60	161.60
<b>Fast Start</b>	113.25	6.05	154.40
<b>Regoplan</b>	107.10	5.50	116.62
Stimulate	108.35	6.35	107.15
Vermistim D	96.85	5.65	111.10
Average of treatment seeds	107.96	6.09	128.03
foliar Albit	110.80	4.40	77.20
Antistress	112.60	5.30	104.70
Agrinos	107.70	5.40	177.33
Biofoge	110.60	5.40	108.50
Fast Start	119.00	6.50	170.70
Regoplan	113.00	5.90	142.40
Stimulate	107.10	7.30	243.70
Vermistim D	111.30	5.50	114.70
Average of treatment foliar	111.51	5.71	142.40
seeds + foliar Albit	105.00	5.90	130.10
Antistress	116.70	4.90	116.00
Agrinos	114.90	5.00	118.60
Biofoge	97.50	5.00	108.70
Fast Start	116.20	6.00	154.80
Regoplan	114.10	4.70	81.00
Stimulate	118.30	5.70	106.80
Vermistim D	108.30	6.10	117.60
Average of treatment seeds + foliar	111.38	5.41	116.70

The longer the pod is, the more seeds it contains, the heavier the seeds and the higher the yield.

In table 3 Foliar treatment use Agrinos, Average length of seed pods is the highest 3.12 cm. Seeds + foliar treatment use Stimulate, Seed weight 25 pcs is the highest 1.60 g. Treatment foliar use Stimulate, Quantity seeds in one pod is the highest 10. Seeds + foliar treatment use Antistress Mass 1 pod is the highest 0.19 g.

Table 3

Effects of different **plant growth regulators on mustard** seed White princess pods under different treatments

**Factor A Factor B Average length, cm Seed weight 25 pcs, g Quantity seeds in one pod Mass 1 pod, g**

Treatment seeds Control	1.90	0.69	6.25	0.07
Albit	2.21	0.92	5.50	0.07
Antistress	2.32	0.84	5.50	0.05
Agrinos	1.95	0.56	5.00	0.05
Biofoge	2.41	0.62	7.00	0.09
Fast Start	2.12	0.64	6.00	0.05
Regoplan	2.05	0.51	6.00	0.06
Stimulate	1.76	0.61	5.00	0.06
Vermistim D	2.22	0.71	5.00	0.05
Average of treatment seeds	2.13	0.67	5.63	0.06
Foliar Albit	1.42	0.24	7.00	0.09



Antistress 1.50 0.87 4.00 0.06  
 Agrinos 3.12 0.82 6.00 0.09  
 Biofoge 1.54 0.74 5.00 0.05  
 Fast Start 1.50 0.63 5.00 0.09  
 Regoplan 1.60 0.57 6.00 0.08  
 Stimulate 1.46 0.69 10.00 0.11  
 Vermistim D 1.92 0.54 6.00 0.05  
 Average of treatment foliar 1.76 0.64 6.13 0.08  
 Seeds + foliar Albit 3.11 0.73 7.00 0.09  
 Antistress 1.64 0.83 7.00 0.19  
 Agrinos 1.08 0.24 5.00 0.02  
 Biofoge 1.48 1.01 5.00 0.04  
 Fast Start 1.66 1.20 6.00 0.04  
 Regoplan 1.64 0.37 4.00 0.04  
 Stimulate 1.40 1.60 4.00 0.09  
 Vermistim D 2.73 0.66 6.00 0.08  
 Average of treatment seeds + foliar 1.84 0.83 5.50 0.07

1000-seed weight is the weight of 1000 seeds expressed in grams. **It is an index** to reflect **the size and fullness of seeds**, a content to test seed quality and crop varieties, and an important basis for field yield prediction.

The oil extracted from mustard seeds was pressed to calculate the oil content of the seeds.

In table 4 Foliar treatment use Stimulate, Mass 1000 seeds is the highest 6.35 g. Treatment seeds + foliar use Stimulate, Yield is the highest 4.9 t/ha. Treatment seeds + foliar use Stimulate, Oil content is the highest 27.58 %.

Table 4  
Effects of different plant growth regulators on the yield of mustard White princess under treatment

Factor A Factor B Mass 1000 seeds, g Yield, t/ha Oil content, %

Treatment seeds Control 4.56 3.40 26.43  
 Albit 5.33 4.00 26.19  
 Antistress 4.76 3.60 25.71  
 Agrinos 4.52 3.40 25.50  
 Biofoge 5.05 3.80 25.25  
 Fast Start 4.72 3.50 25.46  
 Regoplan 4.97 3.70 25.97  
 Stimulate 4.65 3.50 26.00  
 Vermistim D 4.94 3.70 26.31  
 Average of treatment seeds 4.87 3.65 25.80  
 Foliar Albit 4.91 3.50 24.78  
 Antistress 5.06 3.80 25.73  
 Agrinos 5.52 4.10 24.22  
 Biofoge 6.05 4.50 24.33  
 Fast Start 4.58 3.60 25.59  
 Regoplan 5.18 3.90 26.20  
 Stimulate 6.35 4.80 24.41  
 Vermistim D 5.30 4.00 25.56  
 Average of treatment foliar 5.37 4.03 25.10  
 Seeds + foliar Albit 4.82 3.60 26.19  
 Antistress 4.76 3.60 22.08  
 Agrinos 4.41 4.20 24.96  
 Biofoge 4.40 4.60 26.46  
 Fast Start 4.95 3.70 25.89  
 Regoplan 4.45 4.10 24.47  
 Stimulate 4.89 4.90 27.58  
 Vermistim D 5.32 4.00 25.24  
 Average of treatment seeds + foliar 4.75 4.09 25.36  
 Duncan test 1.21 0.65 1.28

1.

### 3.3. Occupational health

Occupational safety is the work area and the corresponding measures taken in the fields of law, technology, equipment, organizational system and education, etc. for the purpose of preventing various accidents and casualties of employees in the course of professional activities. [41].

The "Labor Protection Law" and the "Ukrainian Labor Law" **are the main legal frameworks for labor protection**, supplemented by national inter-departmental and inter-departmental **regulations on labor protection - standards**, regulations, rules, regulations, rules, directives and other documents. It has the effect of legal regulations and is mandatory for all agencies and employees in Ukraine.

In **SNAU-Sumy National Agrarian University** resolves **labor protection** issues through collective agreements. **The draft agreement** was **discussed at the labor collective meeting and approved by the meeting**. Collective agreements include **basic provisions on labor and wages**, working hours, entertainment, material incentives, labor protection, improved productive labor, strengthened productive labor discipline, and social issues.

Labor protection and safety engineers directly manage the formulation and implementation of labor protection organizations and preventive measures. He is the main organizer of labor safety work, and has the obligation to check the safety, industrial hygiene, protection of the organization and compliance with labor laws and regulations of all production units. Labor protection engineers are guided by laws, regulations and orders and instructions of relevant agencies in their actual work [42].

Working conditions are a set of work environment factors that affect work ability and human health in the work process specified by DNAOP 12.6.05- 74. After working in NNVK for three years, no dangerous cases of death have been recorded. However, injuries also occurred during the production of agricultural products.

Agricultural production safety refers to the actual problems of current agricultural production safety, combined with the current situation and development trend of agricultural production, the introduction of field crop

production, field crop emergency measures under natural disasters, facility agricultural production technology, livestock and poultry and aquatic product breeding key technologies; In particular, it introduces the safe use of related agricultural materials that are likely to cause food safety and environmental safety, such as seeds, pesticides, veterinary medicine, and chemical fertilizers.

In agricultural production operations, attention should be paid to pesticide poisoning, electricity safety, and agricultural machinery damage, etc. In actual operation, the dosage ratio of pesticide instructions should be strictly followed, and protective equipment such as protective clothing should be worn; pay attention to the safety of electricity, Power off in time; use agricultural machinery, planters, harvesters, etc. correctly, and do not stop to watch near the machine.

#### 3.4. Environmental Impact Assessment.

Environmental protection covers a wide range and is comprehensive. It involves many fields of natural and social sciences, as well as its unique research objects. People will certainly destroy the local environment in life, survival and development. Environmental protection methods include: adopting administrative, legal, economic, scientific and technological, non-governmental voluntary environmental protection organizations, etc., rational use of natural resources to prevent environmental pollution and destruction, in order to balance the necessary development of the natural environment with the human environment, economic environment, Expand the reproduction of useful resources to ensure social development.

Environmental protection is the act of protecting the natural environment for the well-being of nature and humans at the level of individuals, organizations or governments. The purpose of the Environmental and Resource Protection Law is: to use the environment and resources reasonably, to prevent environmental pollution and ecological damage; to build a clean and suitable environment, to protect people's health; to coordinate the relationship between the environment and the economy, and to promote the development of modernization.

The data of modern **environmental science and the results of production activities have led to the realization of four important factors.**

**The first factor is that the species of any organism** are unique and irreproducible. The destruction of certain animal and plant species is irreparable loss. Such destruction is now even unimaginable, because **some extinct species may be unknown**, But attributes that may be useful to humans. [43] Here should be the preservation of species, the conservation of plant vegetation, the return of animals, the maintenance of biodiversity, the rational and prudent use of genetic modification, the special protection of endangered organisms, the restoration of extinct species, the expansion of habitats, humans and organisms Harmonious coexistence, not bullying other species and so on.

The second factor is natural resources. Not long ago, it was considered to be inexhaustible. More importantly, it was a free gift from nature, but the result was inexhaustible and could **be destroyed**. The quality of **resources under the influence of global** human activities has been evaluated differently. In order **to prevent the deterioration of the** natural environment, protect the mountains, green water, blue sky and sea. This involves not mining privately or cutting trees indiscriminately, minimizing arbitrarily discharging (sewage) and arbitrarily discharging (sewage gas), not overgrazing, not over-developing wasteland, not over-exploiting natural resources, not destroying the ecological balance of nature, etc. The level belongs to the macro level, which can only be solved by relying on governments at all levels to exercise their functions and control. Everyone is responsible for the protection of nature!

**The third factor, the biosphere and its** components, has a fairly **complex structure and complex** operating rules. **Artificial use of ecosystems and the biosphere is a task that** cannot be completed by modern people, and may not be completed for the future of humanity. Most biosphere structures do not have such high stability and plasticity. Humans can destroy them, but it is not enough to restore them and breed them. People play the role of consumers in the ecosystem. Human survival and development are inseparable from the prosperity of the entire biosphere. Protecting the biosphere is to protect ourselves. We must realize the importance and urgency of protecting the ecological environment and take the initiative to protect the environment. Responsibility, create a beautiful environment.

The fourth, and perhaps the most important factor is that modern people realize that he can survive only under the condition of protecting such a natural environment, and as an accomplice of a living organism and modern technological process, he has adapted This natural environment. Outside of systematic agricultural natural management and underestimation of issues of great biological significance, the negative process is particularly exacerbated. We need a completely different rational land use strategy-this is mainly learned from the rough road of agriculture [44]. Make the environment more suitable for the needs of human work and labor → This involves all aspects of people's clothing, food, housing, transportation, and play, which must meet the requirements of science, health, health, and green. This level is microscopic. It can only be solved by citizens' conscious actions, as well as by government policies and regulations as a guarantee, and community organization and education as the guide. Everyone on the planet has the right to protect the planet and the right to enjoy everything on the planet. Oceans, mountains, and forests are all natural, and everyone should take care of them.

Protect **soil and plant resources**. **The soil cover of the** cultivated land of the Sumy National Agricultural University is dominated by typical low-humus chernozem. Land protection refers to the implementation of administrative, economic, and legal management and management of various types of land resources in accordance with the relevant national regulations, laws, regulations, methods, and rules, as determined by the approved land use master plan Protection to ensure that all types of land resources are used reasonably and sustainably. Experts have formulated general principles of soil anti-erosion protection measures. In areas where water and wind erosion coexist, no-tillage, grazing regulation, grassland improvement, and slope greening are particularly important.

Food and cash crops play a great role in protecting the soil during the growing season. The soil structure of the crop planting area utilizes the plant's soil protection ability to prevent soil erosion most evenly. Planting crops according to topographical features can effectively protect the land.

Protection of water resources. The main sources of water resources are rainfall and surface runoff. Water is used to meet the needs of the population and animals. Under the range of animal activities, rainfall and river erosion, Pollution sources can be pig farms, dairy farms and chemical components [45].

Water resources protection work should be carried out in all aspects of people and water. In a broader sense, correct and objective investigation and evaluation of water resources, rational planning and management of water resources are all important means of water resources protection, because these tasks are the basis of water resources protection. From a management point of view, the protection of water resources is mainly "open source and throttling", prevention and control of water pollution.

The chemical composition is located far away from the residential area (300- 350 meters). The arrangement meets the requirements.

Atmospheric air protection. The air surrounding the earth is called the atmosphere. Like fish living in water, we humans live at the bottom of the earth's atmosphere, and we cannot live without the atmosphere for a moment. The atmosphere provides an ideal environment for the reproduction of life on earth and human development. Its state and changes affect human activities and survival from time to time. The impact of atmospheric pollution on the physical state of the atmosphere is mainly caused by abnormal changes in the climate. Sometimes this change is obvious, and sometimes it takes the form of gradual evolution, which is the awareness caused by ordinary people, but if it is allowed to develop, the consequences may be very serious.

About 100 kinds of air pollutants are known. There are two kinds of natural factors (such as forest fires, volcanic eruptions, etc.) and human factors (such as industrial exhaust gas, domestic coal combustion, automobile exhaust, etc.), and the latter are the main factors, especially caused by industrial production and transportation. The main process consists of three links: emission of pollution sources, atmospheric transmission, and damage to people and objects.

Natural source of air pollution:

Forest fires: CO, CO<sub>2</sub>, SO<sub>2</sub>, NO<sub>2</sub>, HC, etc. are emitted

Forest plant release: mainly terpene hydrocarbons.

Ocean wave particles: mainly sulfate and sulfite

In some cases, natural sources are more important than man-made sources. According to relevant statistics, 93% of global nitrogen emissions and 60% of sulfur oxide emissions come from natural sources.

Man-made pollution source

Fuel combustion: The combustion process of fuel (coal, oil, natural gas, etc.) is an important source of pollutants transported to the atmosphere.

Emissions from industrial production processes: such as the release of hydrogen sulfide, carbon dioxide, sulfur dioxide, and nitrogen oxides from petrochemical companies; and the fluoride emissions from phosphate fertilizer plants.

Emissions during transportation: tail gas emitted by cars, ships, and airplanes is the main source of air pollution.

Emissions from agricultural activities: When pesticides are applied in the field, some pesticides will be scattered into the atmosphere in the form of particles such as dust, and those that remain on the crop body or adhere to the crop surface can still be volatile into the atmosphere. Pesticides entering the atmosphere can be absorbed by suspended particulate matter and transported with the airflow to various places, causing atmospheric pesticide pollution. In addition, there is straw burning. [46].

According to the characteristics of the farm environment in the experimental site, we can take measures to improve the environment:

First. Strictly control agricultural inputs.

Promote the use of high-efficiency, low-toxicity, low-residue pesticides and biological pesticides, and vigorously promote and popularize integrated pest and disease control, biological control, and precision application of fertilizers and technologies to achieve benefits and avoid harm, play a beneficial role in pesticides, manage pesticide potential risks, and solve. Regarding the safety of pesticides, we must resolutely prevent abuses and ensure the rational use of agricultural inputs such as pesticides, fertilizers, and feed.

Second. Safety training for agricultural machinery operators.

The agricultural machinery safety department should undertake the training of agricultural machinery operators, strengthen safety education, and train agricultural machinery operators on business knowledge in driving, repair, and maintenance in accordance with relevant regulations and laws and regulations, and correct the wrong behavior of some operators. So that they can correctly operate according to the specifications, in the process of using agricultural machinery, give full play to their own leading role and safely carry out agricultural production [47]. Require the driving operator to develop the technical status of the agricultural machinery before the operation, especially the good habit of checking the parts that affect the safety of the operation, so as to ensure the safety of the operation of the technical status of the agricultural machinery itself and eliminate the hidden dangers of the accident in time.

Third, make full use of and protect the ecological environment.

High-quality and safe agricultural products must grow in a good ecological environment. At this stage, soil pollution in the use of chemical fertilizers, and the reduction of biological species caused by the use of pesticides [48]. Therefore, we must cherish the use of natural endowments, develop ecological, recycling, and low-carbon agriculture as the starting point, optimize the breeding system, promote the development of low-carbon ecological benefits agriculture, strengthen soil environmental protection and comprehensive management, and accelerate the improvement of ecological restoration, conservation and conservation. Carrying capacity and level to create and maintain an excellent agricultural production ecological environment.

Conclusion

Based on the results of research, the following conclusions can be drawn:

1. The average value chlorophylls "a" and "b" in the plant material of treatment seeds is 1.55 mg/g. And the average value chlorophylls "a" and "b" of foliar fertilize is 1.45 mg/g and seeds + foliar fertilize is 1.44 mg/g.
2. Seeds + foliar treatment used Stimulate, n-tester is The highest 55.60. Treatment seeds use Vermistim D, Chlorophyll A and C are the highest 1.67 mg/g.
3. Foliar fertilizer treatment used Fast Start, Height plant is the highest 119.0 cm. Treatment seeds used Biofoge, Quantity branches in one plant is the highest 6.60. Treatment foliar used Stimulate, Number of pods is the highest 243.70.
4. Foliar treatment use Agrinos, Average length of seed pods is the highest 3.12 cm. Seeds + foliar treatment use Stimulate, Seed weight 25 pcs is the highest 1.60 g. Treatment foliar use Stimulate, Quantity seeds in one pod is the highest 10. Seeds + foliar treatment use Antistress Mass 1 pod is the highest 0.19 g.
5. Foliar treatment use Stimulate, Mass 1000 seeds is the highest 6.35 g. Treatment seeds + foliar use Stimulate, Yield is the highest 4.9 t/ha. Treatment seeds + foliar use Stimulate, Oil content is the highest 27.58 %.

## PROPOSALS

**To obtain the highest yield of white mustard in the north-eastern forest-steppe of Ukraine** use treatment seeds + foliar use **Stimulate**. **To increase the oil content in the seeds**, use treatment seeds + foliar fertilize use Stimulate.

Reference

1. Zhang Dongling, Hao Kexing, Zhang Quanfa, Hou Fuen. The effect of concentrated full nutrient vegetable melon and fruit flush fertilization on the yield and quality of rape in greenhouse [J]. Shanxi Agricultural Sciences, 2012, 40 (08): 857-859.

2. AoLilin. Plant growth regulators and micro-fertilizers suitable for rapeseed [J]. Rural Best Communication, 2013(23):59-60.
3. Liu Di, Zhang Ting. Types and application methods of rapeseed foliar fertilizer [J]. Shanghai Vegetables, 2017(01):53-55.
4. Wu Lishu. Soil and fertilizer science [M]. Beijing: China Agricultural Press, 2004:303.
5. Li Yanting, Li Xiuying, Xiao Yan, et al. Research progress on the nutritional mechanism and application of foliar fertilizers [J]. Chinese Journal of Agricultural Sciences, 2009, 42(1): 162~172.
6. Su Tu. Foliar fertilizer application technology [J]. Jiangsu Rural Economy: Brand Agricultural Resources, 2010 (4): 42.
7. Wu Lishu. Soil and fertilizer science [M]. Beijing: China Agricultural Press, 2004:303.
8. Yang Gengsheng. Study on application effect of foliar fertilizer for rape [J]. Modern Agricultural Science and Technology, 2006 (10):42-43.
9. Zhou Shouxian. Applied technology of plant growth regulator [M]. Beijing: China Literature and History Press.
10. Bai dengsha. Mai maitieli, zhangshirong, penghua, yibuyin, wufuer, feng gu. Effects of auxin on growth and boll shedding of long-staple cotton after topdressing. Journal of nuclear agriculture, 2007 (02): 177-180 + 185.
11. Yang a z, mu x l, li m l, yu h b. effects of cytokinins on preventing decline and increasing yield of rice in mulching dry farming [J]. Journal of soil and water conservation, 2005 (02): 199-200. (in Chinese with English abstract)
12. Ukraine country profile, Chinese Ministry of Foreign Affairs 2019-01-01 [reference date 2019-02-11]
13. White mustard *Sinapis alba* L. Chinese plant species information database. [2013-01-15].
14. Wang g p. Cultivation technology of white mustard seed [J]. Rural practical technology, 2006 (07): 28-29.
15. Wang Guangpin. Cultivation techniques of white mustard [J]. Practical Techniques in Rural Areas, 2006(07):28-29.
16. Ma Yamin, Wang Lailiang, Deng Caoren, Lu Huisu, Lei Yin. Zhaobai - Cultivation Techniques of Mustard Rotation [J]. Changjiang Vegetables, 2017(18):118-119.
17. Wang Chuanjin, Liu Yuquan. Study on the extraction process of glucosinolates from white mustard seeds [J]. Chinese Traditional Medicine, 2001(06):426-427.
18. Liu peiyang. Chinese mustard [M]. Beijing: China agricultural press. 1996: 1~78.
19. Chen Dongsheng, Yang Jiaju, Huang Guorong. Effects of rape wall pollen breaking treatment on protein nutritional value [J]. Journal of Nutrition, 1991(02):177-182.
20. Fu Yali, Tian Guoying, Li Zhanjun, JinSujian, Zhao Xuan, Zhao Xuan, Niu Ning, Wang Kaihui. Value of rape flowers and key points of pollution-free cultivation techniques [J]. Modern Rural Science and Technology, 2019(11):106.
21. LU Yuting. Interpretation of high-yield and high-yield cultivation techniques of rapeseed [J]. farm staff, 2020(14):63.
22. World of improved species [J]. Henan Agriculture, 1998(03):4-5.
23. **Climate of Ukraine: In the past... and future? /M. I. Kulbida, M. B. Barabash, L. o. Jelstratova [et al.] /by Ed. M. I. Kulbida, M. B. Barabash: Monograph. Kyiv: Steel, 2009. C. 85 - 98.**
24. Dmytrenko V.P. weather, climate and harvest of field crops. **K: Nika - Center, 2010. 620 S.**
25. **State Register of plant varieties suitable for distribution in Ukraine // Ministry of Agrarian Policy of Ukraine, state service for the protection of Rights to plant varieties (extract as of 07.09.2018 year). Official publication. Kyiv, 2018. 468 p. 7.**
26. Scientifically grounded system of farming **agriculture of Sumy region. Sumy: Cossack Shaft, 2004. 662 S.**
27. Scientific foundations of agroindustrial **production in the forest-steppe zone of Ukraine/ [v. M. Zubets, etc.]; by Ed. V. M. Zubtsya. K.: Logos, 2004. 77**
28. S. **Optimization of integrated Field Crop Protection (Handbook) / by Ed. V. V. Kyrychenko, Y. G. Krasilovecã. X.: Magda LTD, 2006. 252 S.**
29. Rape. **Protection of rapeseed from diseases and pests - Agrosphere /http://www.agroua.net/.../catalog/cg-5/c-19/info/cag-244/**
30. Dopõkhov B. A. Technique of polyemy. Moscow: Agragrinet, 1985. 350 S.
31. Moiseychenko V. F. Ischenko Acting **Fundamentals of Scientific Researches in agronomy: textbook. K.: High School, 1994. 334 S.**
32. Method of state sorting of agricultural crops/ed. V. V. **Volkodav; State. Commission of Ukraine on testing and protection of plant varieties. Kyiv: Alef, 2000, vyp. 1.100 S.**
33. A. Nychyporyvych A. A. Basic photosynthetic performance of the Rapa//contemporary problems of photosynthesis. M.: MSU, 1973. P. 5 - 28.
34. Methods of the Issledovaniã of the Resthic and the editor of A. I. Ermakova. L.: Colossus, 1972. 456 S.
35. **Seeds of agricultural crops. Methods of quality Determination: DSTU 4138. 2002. [Valid from 01.01.2004]. Kyiv: State standard of Ukraine, 2003. 173 S. ( National standard of Ukraine).**
36. Hrytsaenko M., Hrytsaenko A. O., **Karpenko v. P. Methods of Biological and agronomic researches of plants and soils. Kiev: "Nichlava" CJSC, 2003. 320 S.**
37. Ermanrut **E. R. Prysyazhnyuk o. I., Shevchenko I. L. Statistical analysis of agronomic data in the package Statistica - 6//methodical instructions. Kyiv, 2007. 55 S.**
38. **Computer methods in agriculture and biology:** teach. Guidances. /O. M. Tsarenko, Yu. A. Zlodin, V. G. Sklyar, S. M. Panchenko. Sumy: Univ. Livre, 2000. 203 C.
39. M. Kovalchuk Economic Analysis in agriculture: teach-method. Manual for the samist. Study. Disk. Kyiv: KNEU, 2002. 282 S.
40. Medvedovskiy O. K., Ivanenko P. I. Energy analysis of intensive technologies in agricultural production. Kyiv: Vintage, 1988. 208 S.
41. **Law Ukr. on labor protection in the editor. from 21.11.2002 No29 - IV Yaroshenko IF Life safety in engineering solutions, Sumy, "Environment" 2003**
42. **Regulations on the management system of labor protection in Ukraine No35 dated 22.02.2008.**
43. **Tsarenko OM Environment and economics of nature: textbook. manual / OM Tsarenko, Yu. A. Zlobin. - K.: Вищашкола, 1999. - 176с.**
44. **Zlobin Yu. A. Ecological problems of agro-industrial complex of Ukraine on the threshold of the third millennium / Yu. A. Zlobin. - Sumy, 1993. - No3. - P. 4-13.**
45. **Azzi J. Agricultural Ecology / J. Azzi. - M., 1959. - S. 14-18.**
46. Liu Peitong, Xue Jiyu, Wang Huadong. Introduction to Environmental Science. Beijing. Higher Education Press. 1995. 17
47. Zhi Hongtao. Problems and countermeasures of agricultural product quality and safety in Liaoning Province [J]. Agricultural Product Quality and Safety, 2012 (2): 18-21.
48. Zhang Lijian. Several suggestions for further improving the quality and safety of agricultural products [J].

APPENDICES

Appendix A

Our field plots (2019)

Cultivation of mustard

After harvest mustard seeds

2

(

s

)(

s

)(

1

)(

0

)

Measure light intensity

Pick the test plants

Measuring plant physiological indicators

Appendix B

3 D GRAF ANALYSES (Mass 1000 seeds, oil content, yield)

(

0

)(

0

)(

s

)(

e

)(

e

)(

d

)(

s

;

)

Appendix C

ANOVA GRAF ANALYSES (Yield seeds, t/ha)

Appendix D

CONFERENCE MATERIALS

Certificate