Практична робота № 1

Theme: Structure of Scientific Papers

Exercise 1. Read and translate into Ukrainian Introduction parts of the articles.

Introduction

To make the process of development of new cultivars faster it is essential to raise initial homogeneous material as quick as possible. The problem is even more exasperating for those crops where hybrids are more prevalent than varieties. Anther and microspore cultures are the key techniques to overcome this challenge, especially for Cruciferous crops, as they permit to reach full homozygosity in one generation [3]. In spite that many aspects of anther *in vitro* response have already been investigated some issues are still understudied. One of the miss influences of light of different wave length on the morphogenesis *in vitro*. At the same time it is well known differentiated impact of rays of different wave lengths on that process *in vivo*. Although light is not usually considered to be necessary for the induction of androgenesis, for some species, like soybean [8] or *Citrus* [2], light of different quality was essential to produce morphogenic or embryogenic response.

The aim of our preliminary research was to study the action of rays of different spectral regions of visible light on the frequency of appearance of morphogenic structures and their type during cultivation of rapeseed anthers under artificial conditions.

Introduction

Brassica and cereal crops have been cultivated in Southeast Europe since Neolithic, as one of the major segments of the so-called “agricultural revolution”, having commenced in the Near East (Zoharyetal, 2012). The Balkan Peninsula as one of its main routes leading to the continent's center and has remained oriented towards growing these crops until today. In many regions, spring-sown cultivars of both brassicas, such as rapeseed (*Brassica napus* L.) and white mustard (*Sinapis alba* L.), and cereals, like oat (*Avena sativa* L.), barley (*Hordeum vulgare* L.) and common wheat (*Triticum aestivum* L. subsp. *aestivum*) are used for forage production, either as sole crop soring mixtures mostly with annual legumes, such as pea (*Pisum sativum* L.) or common vetch (*Vicia sativa* L.) (Ćupinaetal, 2011, Ćupinaetal, 2014).

Intercropping, most often referring to sowing and cultivating two or more domesticated species at the same place and at the same time together, is one of the most ancient at tested farming designs (Hauggaard-Nielsen et al, 2011). Mixtures of brassicas and legumes proved to be beneficial to both components, especially for the first one, due to an enhanced supply with nitrogen (Cortés-Mora et al., 2010). The agronomic performance of the intercrops of various spring-sown brassicas and cereals has remained rather scarcely examined, although it could provide diverse agricultural practices in contrasting temperate environments with a number of advantages (Mihailović et al, 2014).

The goal of this study was to assess the possibility of intercropping spring-sown brassicas with cereals for green manure, thus examining its suitability for ecological services.

Exercise 2. Read and translate into Ukrainian Material and Methods parts of the articles.

Material and Methods

Two wild species, which are included in *Lunaria* L. genus, were used as initial material. One of these - *L. rediviva* - is characterized by perennial development type. The second species - *L. annua* - is annual plant. These two species were crossed with each other. The F_1 plants of *L. rediviva* x *L. annua* cross combination were self-pollinated and individually harvested.

Resulted seeds were sown in boxes under controlled indoor conditions. After formation of 3-4 well-developed pairs of true leaves, the F_2 plants were visually examined for the presence of tubers on the roots. Simultaneously, the type of plant development was recorded, taking into account that by this time the annual plants of F_2 population started to bloom. Anatomy of root tubers was analyzed using light-microscope technique. The x^2 test was used for comparison of the segregation observed with the theoretically expected ratio (Griffiths et al., 2004).

Materials and methods

Two sunflower genotypes with modified leaf venation were used as initial material. One of these was a mutant isolated in the M_2 generation of ZL-9 line treated with ethyl methanesulfonate (Lyakh, et al. 2005). The leaf veins in this mutant extend in a fan-shaped manner from the base of leaf blade at the point of their attachment to the petiole. The midrib is, as usual, more pronounced than all other veins. The first order (primary) veins are more pronounced and deviate at a more acute angle of 10-30° from the midrib in comparison to the control (Fig. 1). Reticulate leaf venation is the norm for the parent line and the angle of deviation of the other primary veins from the midrib is 50° or more. The second mutation was isolated in the M3 generation following treatment of immature embryos of ZL-95 line with ethyl methanesulfonate (Soroka and Lyakh, 2009). This mutant does not have a clearly pronounced midrib. The major veins are located at a more acute angle in relation to each other than the central and lateral veins in the control parent (Fig. 1). Overgrowing the veins (raised veins) on the upper side (ad axial surface) of the leaf blade is another characteristic feature of this mutation. Leaf surface is rough and not smooth.

Both the parents' trains – ZL-9 and ZL-95 – were received from the Institute of Oilseed Crops, National Academy of Agricultural Sciences. They are characterized by reticulate leaf venation where the lateral veins, not reaching up to the edge of the leaf blade, are branched many times and their numerous branches interconnect to form a network of individual loops. The two mutant lines with different types of fan-nerved leaf venation were crossed with their respective parental lines and among themselves. The F_1 plants were controlled self-pollinated and individually harvested. After formation of well-developed true leaves, the F_2 plants were visually examined for the presence of mutant or normal venation trait. The fitness of the segregation observed to the theoretically expected ratio was subjected to the x^2 test (Griffiths et al. 2004).

Exercise 3. Read and translate into Ukrainian Results and Discussion parts of the articles.

Results and Discussion

Numerous significant differences in two-year average aboveground biomass nitrogen yield in both intercrops and sole crops, as well as in the two-year average values of LER, were observed (Table1).

In the sole crops of spring-sown forage brassicas and annual legumes, the highest two-year average aboveground biomass nitrogen yield varied between 171 kg ha^{-1} in both rapeseed and Narbonne vetch and 327 kg ha^{-1} in grass pea. The white mustard cultivar NS Gorica had much better performance in comparison to the results of a preliminary testing of a series of forage white mustard lines in the same agroecological conditions, with an average aboveground biomass nitrogen yield of 90 kg ha^{-1} (Krstić et al. 2010).

The average two-year average values of total aboveground biomass nitrogen yield in the intercrops of spring-sown forage brassicas and annual legumes ranged from 178 kg ha^{-1} in the intercrop of white mustard and Narbonne vetch and 352 kg ha^{-1} in the intercrop of white mustard and grass pea. The components of this intercrop had the highest and the lowest two-year average individual contribution to the total aboveground biomass nitrogen, with 306 kg ha^{-1} in grass pea and 46 kg ha^{-1} in white mustard, respectively.

All eight intercrops of spring-sown forage brassicas and annual legumes had the average two-year values of LER higher than 1, thus proving their economic reliability, especially in the cases of intercropping rapeseed with pea and rapeseed with common vetch (both 1.23).

Results and Discussion

In both sole crops and intercrops of autumn-sown forage brassicas and annual legumes, there were significant differences in two-year average values of aboveground biomass nitrogen yield and LER (Table1).

The highest two-year average aboveground biomass nitrogen yield in the sole crops of autumn-sown forage brassicas and annual legumes ranged from 189 kg ha^{-1} in rapeseed to 307 kg ha^{-1} in hairy vetch. The two-year average aboveground biomass nitrogen yield in the sole crop of the fodder kale cultivar Perast was somewhat higher than in a previously conducted trial with ten fodder kale cultivars and lines in the same environment, with 183 kg ha^{-1} (Ćupina et al.2010).

Among the intercrops of autumn-sown forage brassicas and annual legumes, the average two-year values of total aboveground biomass nitrogen yield varied between 162 kg ha^{-1} in the intercrop of rapeseed and Hungarian vetch and 319 kg ha^{-1} in the intercrop of rapeseed and hairy vetch. The highest two-year average individual contribution to the total aboveground biomass nitrogen yield was in hairy vetch (253 kg ha^{-1}), when intercropped with rapeseed, while the lowest two-year average individual contribution to the total aboveground biomass nitrogen yield was in rapeseed (67 kg ha^{-1}), when intercropped with hairy vetch.

Not all the intercrops had the average two-year values of LER higher than 1, with the intercrops of rapeseed and hairy vetch (1.18) and fodder kale with hairy vetch (1.13) as the most economically reliable.

Exercise 4. Read and translate into Ukrainian Conclusions parts of the articles.

Conclusion

It was clearly demonstrated that the spring-sown intercrops of forage brassicas with annual legumes have a considerable ability to produce high aboveground biomass nitrogen yield in a relatively brief period, confirming their place in various crop rotations. The presented results also offer a solid basis for considering a possibility of developing cultivars of forage brassicas specifically for green manure.

Conclusions

There is a solid basis to deem intercropping field mustard with autumn-sown legumes and cereals reliable, in terms of both fresh forage yield and the economic aspect of such production, especially significant in feeding milk cows. The future research efforts should be focused on the quality aspects and stress-related issues.

Exercise 5. Read and translate into Ukrainian Abstracts of the articles.

Abstract

Haploid development technique in cauliflower has immense potentiality to accelerate hybrid breeding programme. The technology is being standardized on several Brassica species including cauliflower. However, this technology has not been

undertaken in tropical Indian cauliflower before. Present study is conducted to understand the response of tropical cauliflower variety in anther culture. Two cauliflower varieties *i.e.* Sabour Agrim, a tropical Indian cauliflowe variety and Pusa Hybrid 2, and snowball type cauliflower variety planted in the Vegetable Research Farm, Bihar Agricultural University, Sabour, Bhagalpur in the year, 2014-15. A theirs were collected at uni-nucle a test age of pollen grain. Culture mediums were prepared using MS salt and Gamborg B5 salt. Percent response for callus induction from anthers was varied between the genotypes. Highest response (31.97%) was observed for the variety Sabour Agrim. Among eight types of culture media composition only five were responded for call us induction. M8 medium (B5 salt + 100g/lt sucrose + 1mg/lt 2,4-D + 1mg/lt NAA + 1mg/lt BAP) was found highest responses for development of androgenic callus in tropical cauliflower.

Abstract

The inheritance of two types of modified leaf venation which were called as fan-nerved venation was studied in the cultivated sunflower. Both types of modified venation were isolated in chemical mutagenesis experiments which were conducted earlier. A distinctive feature of one of the mutations is clear appearance of central rib while the second mutation lacks sit. The F_1 plants from crosses between those mutants and between the mutants and genotypes with reticulate leaf venation had the usual reticulate leaf venation of sunflower (the wild type). The test of allelism, thus, demonstrates that the venation in the induced mutations is controlled by a gene (or genes) different from the gene causing the other venation phenotype. The F_2 segregated into four phenotypic classes of leaf venation: reticulate, two groups of both types of modified venation, and plants with the two modified venation types combined in the ratio of 9 reticulate (double dominant phenotype): 3 fan-venation type 1: fan-venation type 2: 1 combined fan-venation (double recessive homozygotes). It is concluded that two non-allelic recessive genes with complementary interaction are involved in the genetic control of fan-nerved leaf venation, and reticulate venation was determined by

a combination of at least two dominant alleles of these genes. The gene symbols proposed are *vf1* and *vf2*.

Keywords: Sunflower, leaf venation, inheritance, two-gene control