Extended Abstract
World Journal of Pharmacology & Toxicology
2020
Vol. 3, Iss. 1

Webinar on Pharmaceutical Chemistry May on 22, 2020 held at Paris, France (Time zone) - The new plant growth regulators based on derivatives of oxazole and oxazolopyrimidine

Tsygankova V.A

NAS of Ukraine, Ukraine

As is known, the major plant hormones cytokinins take an important part in control of embryo patterning, seed germination, de-etiolation, cell cycle control and protein synthesis, chloroplast differentiation, overcoming of apical dominance, releasing of lateral buds from dormancy, flower and fruit development, delaying of leaf senescence, plant-pathogen interactions, and in vitro morphogenesis in plants [1-5]. In our work to review cytokinin-like activity of chemical heterocyclic compounds, derivatives of pyrimidine, pyrazole, isoflavones, and pyridine we used specific bioassay conducted on the cotyledons (i.e. food-storage organs) isolated from seeds of muscat pumpkin (Cucurbita moschata Duch. et Poir.) cultivar Gilea. As is known, this bioassay is based on key role of cytokinins in regulation of cell division in isolated plant organs, which leads to an increase in their biomass [1, 6]. The activity of chemical heterocyclic compounds was compared with the activity of plant hormone cytokinin Kinetin. The specific bioassay on cytokinin-like activity showed that among heterocyclic compounds, derivatives of oxazolopyrimidine and oxazole, used at the concentration 10-9M in water solution, the highest activity on the growth of biomass of cotyledons isolated from seed of muscat pumpkin (Cucurbita moschata Duch. et Poir.) cultivar Gilea demonstrated the compounds: the compound №2 - 2,5-diphenyl[1,3]oxazolo[5,4-d]pyrimidin-7(6H)-one, which contains phenyl substituent at the 5th position of pyrimidine fragment, the compound №4 - 7-amino-5-(4-ethylphenyl)-2- phenyl[1,3]oxazolo[5,4-d]pyrimidine, which contains amino group at the 7th position of pyrimidine fragment, and the compound №6 - 2-tolyl-5-(piperidin-1-ylsulfonyl)-1,3-oxazole-4-carbonitrile, which contains tolyl substituent at the 2nd position of oxazole. It is obvious that cytokinin-like activity on the growth of the biomass of cotyledons isolated from seed of muscat pumpkin (Cucurbita moschata Duch. et Poir.) cultivar Gilea of chemical compounds, derivatives of oxazolopyrimidine may depend upon substituents at the 5th and 7th positions of pyrimidine fragment, while as activity of compounds, derivatives of oxazole may depend on substituents at the 2th position of oxazole. The obtained results confirmed the inducing cytokinin-like effect of synthetic heterocyclic compounds on plant cell elongation, division, and differentiation that are the basic processes of plant growth. The practical application of derivatives of oxazolopyrimidine and oxazole as new plant growth regulators was proposed.

Chemical structure of tested synthetic LMWHC:

Our research was devoted to screening of new plant growth regulators based on synthetic LMWHC for intensification of vegetative growth of cucumber. The plant growth regulatory activity of synthetic LMWHC, derivatives of [1,3]oxazolo[5,4-d]pyrimidine (compounds № 1-4) and N-sulfonyl substituted of 1,3-oxazole (compounds № 5-12) was studied. The LMWHC were synthesized at the Department for chemistry of bioactive nitrogen-containing heterocyclic compounds of Institute of Bioorganic Chemistry and Petrochemistry of NAS of Ukraine. The growth regulatory activity of LMWHC was compared with the activity of plant hormone auxin IAA.

Plant growth conditions: In the laboratory conditions we studied impact of phytohormone auxin IAA and artificial LMWHC, derivatives of [1,3] oxaz-

Note: This work is partly presented at Webinar on Pharmaceutical Chemistry May on 22, 2020 held at Paris, France (Time zone)

olo [5,4-d] pyrimidine and N-sulfonyl substituted of 1,3-oxazole on germination of seeds and vegetative growth of cucumber (Cucumis sativus L.) of cultivar Dzjerelo. With this aim the cucumber seeds were surface sterilized in 1 % KMnO4 solution for 3 min and 96 % ethanol solution for 1 min, and then washed three times with sterile distilled water. After this procedure seeds were placed in the cuvettes (each containing 25-30 seeds) on the perlite moistened with distilled water (control), or with water solution of either derivatives of [1,3] oxazolo [5,4-d]pyrimidine, or N-sulfonyl substituted of 1,3-oxazole, or auxin IAA used at an equivalent concentration 10-9 M. After this procedure seeds were placed in the thermostat and germinated in the darkness at the temperature 23 °C during 48 h. Sprouted seedlings were placed in the plant growth chamber in which seedlings were grown for 24 days at the 16/8 h light/dark conditions, at the temperature 24 °C, light intensity 3000 lux and air humidity 60-80 %. The comparative analysis of biometric indices of seedlings (i.e. number of germinated seeds (%), length of the over ground part of the seedlings (cm), total number of roots (pcs), total length of roots (mm)) was carried out at the 24th day after their sprouting according to the guideline.

Conclusion: Study of plant growth regulatory activity of synthetic LMWHC, derivatives of [1,3] oxazolo [5,4-d] pyrimidine and N-sulfonyl substituted of 1,3-oxazole showed that some heterocyclic compounds used at concentration 10-9M revealed the high stimulating effect on the growth of the 24th -day-old seedlings of cucumber (Cucumis sativus L.) of cultivar Dzjerelo. Obviously, that the high plant growth regulatory activity of derivatives of [1,3]oxazolo[5,4-d]pyrimidine and N-sulfonyl substituted of 1,3-oxazole can be explained by their auxin-like and cytokinin-like stimulating effect on processes of enlargement, proliferation and differentiation of plant cells, intensification of processes of photosynthesis and protein biosynthesis in plant cells leading to formation of plant tissues and organs, and acceleration of plant growth and development [81-87]. The relationship between chemical structure and plant growth regulatory activity of synthetic LMWHC was observed. The obtained results confirmed the possibility of the practical application of synthetic LMWHC, derivatives of [1,3]oxazolo [5,4-d]pyrimidine and N-sulfonyl substituted of 1,3-oxazole as new

effective regulators of vegetative growth of cucumber plants.

Note: This work is partly presented at Webinar on Pharmaceutical Chemistry May on 22, 2020 held at Paris, France (Time zone)