Ключевые слова: ***горелочное устройство, цилиндрический стабилизатор пламени, турбулизаторы потока, структура течения***

SPECIFICS OF BURNER AERODYNAMIC WITH CYLINDRICAL FLAME STABILIZERS IN THE PRESENCE OF TURBULENCE STIMULATORS OF FLOW ON THEIR STALLING EDGES

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Annotation. *The results of comparative studies of the flow structure of fuel and oxidizer in the burner with cilindrical flame stabilizers in the presence and absence of flat turbulence stimulations of the flow on their stalling edges are preesented. The specifics of the aerodynamic for the burners series with turbulence stimulations of the flow for a capacity of 30-200 kW.*
Key words: ***burner, cylindrical flame stabilizer, turbulence stimulations of the flow, flow structure***

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DRONES CAMERA CALIBRATION FOR THE LEAF RESEARCH

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Annotation. *The drone camera calibration issues in the field without the use of optical patterns. The effect on the result of soil entering the frame.*
Key words: ***camera, drone, leaf diagnosis***

Rational use of mineral fertilizers in crop production has been particularly true in Ukraine in recent years. Obtaining high yields of cereals and high-quality products is often not possible without ensuring the timely fertilizing crops. But in agrophytocenosis plants need nutrients, usually, which are not uniform for the entire field and often has random nature. Adding the necessary doses of fertilizers in accordance with the requirements of the plants is an integral part of precision farming technology. But today, new technologies require agrochemical research express methods. Classical methods related to chemical analyzes are not adapted to mass research, because of time-consuming and may not always be applied but at the same time the actual period for fertilizer feeding is only a few days. An alternative to the use of chemical methods is the research of leaf diagnostics, when plant tissues are determined by means of problems in plant nutrition. Leaf diagnostics, in particular the definition of such vegetation indices like the NDVI, actively used in space research, which was true for large agricultural producers. Previously conducted the scientific research of the diagnosis leaves using a spectrophotometer [1], but the complexity of the equipment and problems with radio frequency correction become a serious obstacle to the mass adoption of these techniques.

The appearance on the domestic market relatively inexpensive unmanned aerial vehicles (drones) with a flight altitude of several hundred meters gives farmers a fundamentally new research tool with fundamentally new features. For the use of drones when conducting diagnostic leaves is necessary to solve a number of technical problems on the methodology of this equipment's usage. The purpose of research - the study of drones' modes for monitoring the condition of the plant, providing them with nutrients, namely the study of the influence of the flight's height on the brightness ratios RGB planting.

Experimental studies were carried out from 20 to 24 May 2016 in Kiev Svyatoshinsky district, Kyiv region (GPS coordinates are 50 deg 19 '49,00 "N, 30 deg 24' 40,00" E). Flight altitude was determined from the readings of the control panel of the drone and manually was recorded in the journal of the experiment. The monitoring was conducted in the period from 14.30 to 17.30 hours. Artificial lighting study sites has not been used. There has been usage of quadrocopter for the monitoring. The objects of monitoring were selected from field plots sown with winter wheat in the growing stage "earing" and a dirt road with a visually clear boundaries, the location of which was determined from the characteristic visual references. In conducting research drone was positioned approximately midway between the studied areas of the field and the road.

The studies were conducted in the altitude range of 200 m. According to the passport the tool could reach a greater altitude, but in practice, at altitudes above 300 m discovered a problem with the control device, due, apparently, clogging noise control radio channel from the third-party sites, such as high-voltage transmission line. In addition, at altitudes above 200 meters there were difficulties in fixing guidelines for which were selected for the study areas, at the expense of achieving the upper limit of the resolution of standard cameras. Fixing the RGB values was carried out by regular PHANTOM

VISION FC200 digital camera with a resolution of 10.8 × 10^6 pixels. For research to improve the accuracy of the results manual mode was changed, the exposure time of the camera was automatically recorded in exiff file.

In the experiments took into account the presence of shadows on the test section of the field from the clouds. Not allowed to study the subject that is partly in the shade.

Soil in the monitoring zone was in dry air condition. The test section of the field road had no clearly defined humps and hollows, traces of puddles or vegetation. The road was previously used for the passage of heavy wheeled agricultural machines, in consequence of which the soil was compacted.

Processing of the results was carried out in the laboratory using the proprietary software Land damage expert, described previously [2, 3]. In monitoring camera's digital zoom function was not used, the study section was selected in manual mode from a total picture. Official photo data was automatically entered in the exiff file and was read by on-line service [4].

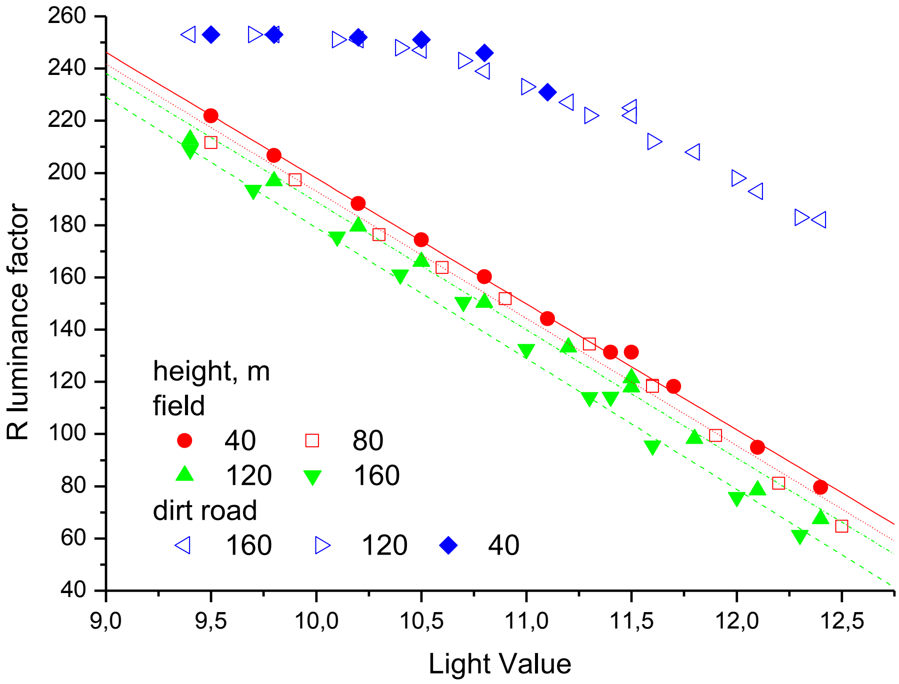

Figure. The dependence of R luminance factor of the value of Light Value for the area in the field of wheat

Figure shows the results of the relation between R luminance factor of wheat field and the magnitude of Light Value at different heights drone flight. As can be seen from the data, the dependence of the red component of the luminance factor of the magnitude of Light Value is linear (value adjusted r-squared ≥0,992). According to G and B components the dependence also has a linear character. With increasing height of the drone above test site of wheat field the luminance values of coefficients is reduced, which is not observed for the studied area in a dirt road. This leads to the conclusion that the coefficients uniform brightness of the object stable in a range of heights up to 200 meters as the most suitable for remote-controlled drones class micro. For values of

Light Value ≤10,5 R value of the luminance factor, which has an 8-bit reached the boundary values and is no longer subject to change, which explains the stabilization at 253-255.

In our opinion, there is a relationship between the coefficients of the brightness and the drone flight altitude due to the fact that the field is not uniform in the frame, in addition to plants and shade created by them, the lit ground gets into the shot.

In this case, air dry ground considerably lighter than plants. With increasing distance between the drone and the resolution of the camera field capacity decreases, whereby the ground is fixed to a lesser extent and accordingly varies the average value of the luminance factor. Also worth noting is that the wet soil much darker than the plant and, accordingly, an inverse relationship is observed after the rain. Accordingly, for precise measurement of the brightness coefficients when leave diagnosis is necessary to filter sheet portions corresponding to the ground.

The studies were conducted both in the clear sky, and in cloudy weather. In both cases, Light Source value indicated in the manual mode as an Cloudy, and Fine Weather. In the red and green components were recorded significant difference, the blue component in the case of the values of Light Source - Cloudy value B brightness ratio was significantly lower, which is undesirable for metrological reasons. Apparently, this is due to the conversion algorithms of initial information given in the JPEG format camera manufacturer.

Conclusion

1. The dependence of the brightness coefficients in the RGB color formation additive function from the parameter Light Value at altitudes up to 200 meters is linear.

2. In determining the brightness coefficients of plants for leaf diagnosis must be taken into account the presence of soil in the frame.

3. With an increase in the influence of color on the ground monitoring the height of the brightness value of the coefficient is reduced.

Literature

1. Шадчина Т. М. Розробка теоретичних основ та методів дистанційного моніторингу стану посівів озимої пшениці за допомогою спектрометрії з високим спектральним розділенням : автореф. дис. …д-ра біол. наук : спец. 03.00.12 «Назва спеціальності»/ Т. М. Шадчина; НАН України. Ін-т фізіології рослин і генетики. - К., 1999. - 34 с.

2. Андріїшина М. В. Удосконалена методика визначення вмісту гумусу в чорноземних грунтах на базі цифрової фотометрії / М. В. Андріїшина, С Ю. Булигін, О.О. Опришко // Аграрна наука і освіта. - 2007. - Т.8. - №5-6. - С. 80-84.

3. Методичні підходи для керування вибірковим внесенням добрив / О. О. Опришко, І. М. Болбот, М. В. Андріїшина, Н. А. Пасічник // Аграрна наука і освіта. - 2008. - Том. 9, №3. - С. 100 - 104.

4. Processing of JPEG photos online. Режим доступу: http://www.imgonline. com.ua /exif-info-result.php

References

1. Shadchyna T. N.(1999) Rozrobka theoreticheskih osnov is distantsiynogo methodiv monitoringu stany posiviv ozimoï phenitsi za dopomogoyu spektrometriy z visokim spektralnim rozdilennam [Development of theoretical bases and methods of remote condition monitoring of winter wheat using spectroscopy with high spectral resolution]. Kiev, 34.
2. Andriïshina. M. V., Buligin.S. Yu., Opryshko O. O. (2007). Improved method of determining the content of humus in the black earth soils based on digital photometry [Udoskonalena metodika viznachennya vmistu gumus v chornozemnih gruntah na bazi tsifrovoï fotometriï] Agricultural science and education, 5-6. 80-84.
3. Opryshko O. O., Bolbot I. M., Andriïshina. M. V., Pasichnik N. A. (2008) Methodological approaches to control selective fertilizer [Metodichny pidhody dly vibirkovim vnesennym dobriv] Agricultural science and education. 3. 100 - 104.
4. Processing of JPEG photos online : http://www.imgonline.com.ua/exif-info-result.php

КАЛИБРОВКА ФОТОКАМЕРЫ БПЛА ДЛЯ ЛИСТОВОЙ ДИАГНОСТИКИ

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Аннотация: *Рассмотрены вопросы калибровки камеры БПЛА в полевых условиях без использования оптических шаблонов. Показано влияние на полученный результат попадания грунта в кадр.*

Ключевые слова: ***фотокамера, дрон, листовая диагностика***

КАЛІБРУВАННЯ ФОТОКАМЕРИ БПЛА ДЛЯ ПОТРЕБ ЛИСТОВОЇ ДІАГНОСТИКИ

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Ключові слова: ***фотокамера, дрон, листкова діагностика***