necessary to keep separate records of the pT1a and pT1b stages, as there are differences in approaches and treatment results.

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The adaptive potential of workers in greenhouse farms in the Voronezh region

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Abstract

Adaptive potential is an indicator of the level of adaptability of the human body to various and changing environmental factors. The adaptive capabilities of the body are influenced not only by external factors, but also by internal - the state of the body as a whole, by the presence or absence of chronic diseases. Therefore, the adaptive potential was used as an integral indicator of a person's adaptability to production factors. The aim of the study was to assess the adaptive capabilities of the organism of workers in greenhouse farms in the Voronezh region. The study was carried out at the enterprises of the closed ground of the region by the method of questioning, the objects of the study were 125 women aged 27-45 years. In most cases, there are violations of the adaptive capabilities of the organism among the studied workers of greenhouse farms, and even a breakdown in adaptation was revealed in 0.8%. In less than half of the cases, the adaptive potential of the greenhouses was within the normal. The adaptive reserves of the greenhouses workers decrease with age.

Keywords: greenhouse workers, lifestyle, primary risk factors, adaptive potential.

The socio-economic and socio-political well-being of the country is determined by the health of the working-age population. The priority task of each state is to preserve and strengthen the health of the population [1, 2]. The main production factors affecting a working person are "triggers" for the formation of occupational pathology and the occurrence of neuro-emotional overload. The health level also depends on individual adaptive capabilities. [3]. Adaptive potential is an indicator of the level of adaptability of the human body to various and changing environmental factors. The adaptive capabilities of the body are influenced not

only by external factors, but also by the state of the body as a whole, by the presence or absence of chronic diseases [4]. Therefore, the adaptive potential was used as an integral indicator of a person's adaptability to production factors. Despite the mechanization and automation of a number of technological processes, growing vegetables in greenhouses remains one of the labor-intensive branches of agricultural production. During work, greenhouses are affected by various production factors: unfavorable microclimate parameters and work in a forced working position at all stages of the vegetable growing process.

The aim of the study is to assess the adaptive capabilities of the organism of workers in greenhouse farms in the Voronezh region.

Materials and Methods: The study included a questionnaire survey of 125 women - workers of greenhouse farms in the Voronezh region in three age categories: 27-29 years old, 30-39 years old and 40-45 years old. The results of the research included general questions (age, height, weight), information about the state of the cardiovascular system (systolic blood pressure (SBP), diastolic blood pressure (DBP), heart rate (HR)). The calculation of the body mass index (BMI) was carried out according to the Quetelet formula - body weight (in kg)/height² (in meters). The calculation of the adaptive potential (AP) was carried out using the formula proposed by R.M. Baevsky, (1987).

$$AP = 0.011 * HR + 0.014 * SBP + 0.008 * DBP + 0.014 * A \text{ (age, year)} + 0.009 * W \text{ (weight, kg)} - 0.009 * P \text{ (height, cm)} - 0.27.$$

The results were assessed as follows:

AP below 2.60 - satisfactory adaptation;

AP 2.60-3.09 - tension of adaptation mechanisms;

AP 3.10-3.49 - unsatisfactory adaptation;

AP 3.50 and higher - adaptation failure.

The analysis of the obtained results was carried out using the Microsoft Excel 2010 software package with the calculation of mean values (M), mean error (m), reliability of differences according to Student's t-test, χ^2 . Differences were considered statistically significant at a significance level of $p < 0.05$.

Results and discussion

According to the results of calculating the adaptive potential on the basis of anthropometric and hemodynamic indicators, it was revealed that there were some deviations from the normal AP indicators in more than half of the cases (58.4%, $p = 0.005$), a breakdown in adaptation was noted in 0.8% of cases (1 respondent). In other cases (40.8%), female workers had a normal AP value (satisfactory adaptation), (fig. 1).

Figure 1. The structure of the adaptive potential of female workers in the agro-industrial complex in the Voronezh region, %.

Female workers in the agro-industrial complex were divided into study groups according to their age, (table 1).

Table 1.

Characteristics of the studied groups of greenhouses.

Groups	Age, year	Number of respondents, n	Average BMI, $M \pm m$, kg/m^2	AP, $M \pm m$
1	27-29	21	$22,52 \pm 3,25$	$2,39 \pm 0,07$
2	30-39	56	$24,61 \pm 4,12$	$2,66 \pm 0,05$
3	40-45	48	$25,86 \pm 5,31$	$2,98 \pm 0,05$

The performed correlation analysis showed that with age, the adaptive reserves of the body gradually decrease ($r = 0.64$, $p < 0.05$) due to the influence of both external factors (the level of labor activity, stress, ecological situation, socio-economic environment, etc.) and internal (decreased immune status and reactivity of the body, chronic diseases, accumulated fatigue, etc.). An analysis of the structure of indicators of adaptive potential among the studied groups of women is shown in figure 2.

Figure 2. Structure of adaptive potential in different age groups, %.

At the age of 27-29 years, satisfactory adaptation was observed in 85.71% of cases ($p = 0.005$ and lower in relation to the 2nd and 3rd groups), while in the age range of 40-45 years this indicator is 8.22 times lower and was only 10.42% ($p < 0.0001$).

By itself, the deviation of AP from normal values may indicate an overstrain of regulatory systems, especially the sympathetic nervous system, which is manifested by changes in the cardiovascular system [5, 6]. However, an interesting fact is that the human body weight has a direct effect on the cardiovascular system and its functions. Many studies have confirmed that overweight / obesity entails both structural and functional changes in the heart itself, affects blood volume and ejection fraction, resulting in an increase of diastolic pressure. The formula for calculating the adaptive potential, proposed by R. M. Baevsky in 1987, includes not only hemodynamic parameters (blood pressure, heart rate), but also structural and metabolic parameters (height, weight), which are also indicators of the body's adaptive reserve [7].

It is known that most people reach maximum values in body weight by 40-45 years. This is one of the manifestations of the so-called age adaptation, which ensures the constancy of homeostasis and energy metabolism against the background of a decrease in physical activity [8]. In addition, it is worth considering the fact of the onset of menopause, in which, against the background of changes in the hormonal background, there is an active accumulation of adipose tissue in the woman's body.

The frequency of occurrence of "stress of adaptation" tended to increase with age: in the 1st group - 9.52%, in the 2nd - 35.71%, in the 3rd - 56.25%, the differences were significant between all age groups - respectively $p(1:2)=0.019$, $p(1:3)=0.0002$ and $p(2:3)=0.029$. Unsatisfactory adaptation was also significantly more common among

greenhouses in the 40-45 age group - 33.33%, 4.77% in the 1st group and 12.51% in the 2nd (p=0.009 in relation to the 1st group and p=0.01 in relation to the 2nd group).

In the age group of 30-39 years, normal and pathological values of the adaptive potential were equally common: satisfactory adaptation - 51.78%, adaptation stress - 35.71%, unsatisfactory adaptation - 12.51%. This age for greenhouse workers is among the most optimal in terms of assessing the functional state of the cardiovascular and muscular systems [9]. Carrying out preventive measures can prevent the progression of adaptation disorders at the initial stage of its occurrence.

Conclusions

In most cases (58.4%, $p = 0.005$), there are disturbance of the adaptive capabilities of the organism among the studied workers of greenhouse farms, and even a breakdown in adaptation was revealed in 0.8%. In less than half of the cases, the adaptive potential of the surveyed respondents was within the normal range - in 41.6%. The adaptive reserves of the body decrease with age ($r = 0.64$, $p < 0.05$). If at the age of 25-27 years the incidence of unsatisfactory adaptation was observed in isolated cases (4.77%), in the age group of 40-45 years - amounted to 33.33% of cases. Thus, with age, in the case of persisting level of labor activity, there is a risk of developing adaptation disorders. The “turning point” age period, when preventive measures can prevent the occurrence of adaptive disorders at the initial stage, was the age of 30-39 years, where normal and pathological values of the adaptive potential were equally common (51.8% and 48.2%, respectively).

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