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# INFLUENCE OF FERTILIZERS ON FERTILITY OF DARK-GRAY PODZOLIC SOIL BY DIFFERENT CULTIVATION TECHNOLOGIES OF CARROT.

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*Influence of fertilizers application on fertility indexes of dark-gray podzolic soil by ridge and ridge-less technologies of carrot cultivation was studied in this article.*

***Carrot, cultivation technology, fertilizers, fertility indexes.***

Soil is mains ource of nutrients for plant. Productivity of agricultural crops depends on soil granulometric composition, chemical properties, presence of available for plants forms of nutrients, soil medium reaction and some other indexes. In soil continuously go processes of nitrogen transformation: ammonia-immobilizing bacteria, most of actinomycetes, microscopic fungi and other microorganisms favors to mineralization of soil organic matter and release of available for plants ammonium nitrogen [5, 9]. It is well known that nitrogen of compounds that e asilyhydrolyzed is reserve of this element that in nearest future could be available fo rplants. Quantity of this form stipulated by genetic features of soil and is one of the basic indexes of its provision with available nitrogen.

Phosphorus is a part of organic as well as mineral compounds in soil. But main role in plant nutrition belongs to mineral compounds of phosphorus that represented by remains of phosphorite, apatite and phosphoric acid salts. They are in soil in continuous interaction and dynamic equilibrium stipulated changeability of availability of phosphorus compounds to plants. Phosphate regime depends on redox conditions, intensity of microbiological processes and phosphatase activity of soil [7].

Potassium in soil as well as phosphorus is one of the basic nutrients for plants and in particular for carrot. With application of potassium fertilizers the content of water soluble form of this element significantly increases and in turn influenced on potassium dynamic along vegetation period. With recurrent

application in high doses this element on heavy loamy soils immobilized by minerals transforming in less available to plants form [10].

Demand of carrot to nitrogen increased during active growth of vegetative organs. Deficit of this element leads to detain in leaves apparatus development and decrease in photosynthesis intensity that negatively results on yields and quality of roots. But excessive nitrogen nutrition also has negative results. [3, 8].

According to Kononchyk V.V. [4], study in gofmovable phosphorus compound in soil during vegetation period depending on fertilizers dos e allows to set degrees of plant provision with this element at different stages of growth and development of plant and determine optimal for formation of maximal possible yield content of phosphorus. In nutrition of carrot abovementioned element could be a limiting factor at stages of seedlings appearance, root system development and intensive growth of root and leaves [2]. Thus to provide optimal growth of plant in these periods we should ensure sufficient level of phosphorus nutrition. Application of phosphorus fertilizers is one of the most powerful tools to improve root system development because high concentration of nutrients in soil favors to proper absorption of them with root system [6].

Sufficient potassium nutrition favors water retention by plant and enhances endurance to short term droughts. Deficiency of potassium retards a range of biological processes, decrease resistance of plant to fungi infection and worsening root storage properties [1].

**Research objectives.** Optimizationofcarrotnutritionandagrochemicalpropertiesofdark-graypodzolicsoilbyapplicationoffertilizersandmoderncultivationtechnologies.

**Researchmethodology.** Field trials were laid down on dark-gray podzolic slightly-loamy soil which had been formed on loess loams. Content of humus in arable layer made up 3.0 %, subarable – 2.4 % and $pH_{KCL}$ –6.3. Soil has medium level of easily hydrolyzed nitrogen and movable phosphorus compounds supply and high supply with exchangeable potassium. Content of easily hydrolyzed nitrogen in soil samples was determined by method of Turin and Kononova and movable phosphorus and exchangeable potassium - by Kirsanov in CINAO

modification in one batch with further determination of phosphorus with colorimetric method and potassium - flaming colorimetry.

In our trials following fertilizers were used: ammonium nitrate with N content – 34.5 % (SST 2-85), granulated superphosphate with $P_2O_5$content – 19.5 % (SST 16306-80), potassium-magnesium with $K_2O$ content – 27% (SST 844-79), Kemira Grouhau "Kemira potato-5", (chlorine-less complex fertilizer with content of N – 10.7%, $P_2O_5$ – 8.7%, $K_2O$ – 16 % + micronutrients) and Aquarin № 5 (N – 18.0; P – 18.0; K – 18.0; MgO – 2.0; S – 1.5 % and micronutrients: Fe – 540, Mn – 420, B – 200, Zn – 140, Cu – 100, Mo – 40 mg/kg). Solid fertilizers were applied under pre-sowing cultivation. Top dressing of carrot with Aquarin № 5 was provided by spraying of plants in variants 6 and 7 at stage of root formation and 8 and 9 – intensive root growth.

**Results and discussion.** We established that easily hydrolyzed nitrogen compounds content in arable layer correlate with fertilizers rates. Thus in variants with high rates of nitrogen fertilizers ($N_{135}$) higher accumulation of them were admitted (table 1). This trend was observed for both ridge and ridge-less technologies. Alongside with passing of growth and development stages by plants the decrease in nitrogen content was found. Thereby at seedlings appearance stage nitrogen content was rather higher than those at the beginning of technical maturity.

In variants with application Kemira Grouhau "Kemira potato-5" fertilizer content of nitrogen compounds was somewhat higher than in other variants. This trend was actual regardless of chosen cultivation technology not only for recommended rate of $N_{90}$but also for $N_{135.}$

In variants with application of phosphorus fertilizers was admitted accumulation of movable phosphorus compounds that had positive effect on phosphorous regime in a whole. The highest accumulation was observed in variant with application $P_{105}$regardless of chosen cultivation technology. According to carrot growth and development stages movable phosphorous compounds content dynamic was similar to nitrogen dynamic.

We established positive influence of fertilizers application on accumulation of exchangeable forms of potassium. Disregarding on high level of soil provision with exchangeable forms of potassium, application of potassium fertilizers favors to further accumulation of this element in soil. Increase in potassium content in soil was observed in all variants where fertilizers were applied compare to control (without fertilizers application) regardless of chosen cultivation technology. Thus with ridge-less cultivation technology content of potassium was on 16-46 mg/kg higher compare to control (135 mg/kg) whether with ridge technology on 18-50 mg/kg higher than control 127 mg/kg. Highest content of potassium was found with application of $K_{180}$as potassium-magnesium and made up 181 mg/kg with ridge-less technology and 177 mg/kg with ridge technology.

**Table1. Influenceoffertilizersoncontentofbasicnutrients (mg/kg) inarablelayer (0-25 cm) ofdark-graypodzolicsoilbydifferentcultivationtechnologiesofcarrot, 2005-2007.**

| Trials variant | Plant growth and development stage | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Seedlings appearance | | | | | | Beginning of technological ripeness | | | | | |
| | Ridge-less | | | Ridge | | | Ridge-less | | | Ridge | | |
| | N e.h. | $P_2O_5$ | $K_2O$ | N e.h. | $P_2O_5$ | $K_2O$ | N e.h. | $P_2O_5$ | $K_2O$ | N e.h. | $P_2O_5$ | $K_2O$ |
| Without fertilizers (control) | 51,3 | 142 | 135 | 49,9 | 148 | 127 | 39,5 | 121 | 122 | 38,3 | 119 | 114 |
| $N_{90}P_{70}K_{120}$ (simple fertilizers) | 61,8 | 166 | 152 | 62,3 | 163 | 149 | 46,9 | 145 | 137 | 46,9 | 138 | 132 |
| $N_{90}P_{70}K_{120}$ (complex fertilizers) | 63,1 | 160 | 151 | 63,9 | 167 | 145 | 46,9 | 141 | 135 | 47,2 | 140 | 137 |
| $N_{135}P_{105}K_{180}$ (simple fertilizers) | 85,5 | 190 | 181 | 83,1 | 184 | 177 | 62,5 | 160 | 158 | 59,8 | 161 | 155 |
| $N_{135}P_{105}K_{180}$ (complex fertilizers) | 86,3 | 178 | 178 | 83,6 | 176 | 175 | 65,2 | 152 | 155 | 62,0 | 148 | 154 |
| $N_{90}P_{70}K_{120}$ (simple fertilizers) + Aquarin (3 kg/ha) | 62,9 | 159 | 146 | 60,8 | 156 | 143 | 44,8 | 143 | 133 | 48,1 | 138 | 131 |
| $N_{90}P_{70}K_{120}$ (complex fertilizers) Aquarin (3 kg/ha) | 65,1 | 165 | 159 | 62,5 | 160 | 156 | 50,2 | 144 | 144 | 48,4 | 141 | 140 |
| $N_{90}P_{70}K_{120}$ (simple fertilizers) +Aquarin (3 kg/ha) + Aquarin (3 kg/ha) | 63,7 | 163 | 161 | 63,0 | 167 | 160 | 53,2 | 145 | 147 | 46,8 | 146 | 145 |
| $N_{90}P_{70}K_{120}$ (complex fertilizers) +Aquarin (3 kg/ha) + Aquarin (3 kg/ha) | 62,5 | 167 | 163 | 60,9 | 164 | 165 | 53,0 | 159 | 146 | 49,2 | 151 | 143 |

It worth to mention that with further growth and development of carrot plants content of exchangeable potassium decreased. Application of potassium fertilizers in increased rate ($K_{180}$) was found as efficient because carrot is highly demandable to supply of soil with available forms of potassium.

## Conclusions

Thus it was established that nutrition regime of carrot on dark-gray podzolic soil mainly determined by rates of mineral fertilizers application. Application of $N_{135}P_{105}K_{180}$positively influenced on accumulation of available to plants forms of basic nutrients in soil with ridge-less as well as ridge cultivation technology of carrot.