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Importance of Rotation Systems in Grains

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ABSTRACT

Rotation is the introduction of suitable plants into the production system in advance and successive, by using appropriate techniques in order to increase the soil quality and to increase the yield and quality parameters. Individuals engaged in agricultural production want to obtain products with low production costs and high market prices by maintaining soil quality in order to obtain high income in agricultural areas. It is very important to determine the varieties with high adaptability in the region in determining the suitable rotation system for the region. The knowledge levels and habits of producers are effective in determining production methods. The prices of the manufactured products vary from year to year and the revenues of the producers. Farmers who carry out agricultural production should choose the rotation system and grains suitable for the rotation. The aim of this study is; ensure that manufacturers identify high adaptability in the field of agriculture and grain manufacturer specifying the location of their study is to help determine the rotation system. Many studies on rotation have been conducted in our country and in the world, and important results have been obtained as a result of the researches.

Keywords: *Grains, Plant, Quality, Rotation, Rotation techniques, Yield.*

Tahıllarda Rotasyon Sistemlerinin Önemi

ÖZ

Rotasyon, toprak kalitesinin artırılması, verim ve kalite parametrelerinin artırılması için uygun bitkilerin uygun teknikler kullanılarak üretim sistemine önceden ve ard arda dahil edilmesidir. Tarımsal üretim yapan bireyler, tarımsal alanlarda yüksek gelir elde etmek için toprak kalitesini koruyarak düşük üretim maliyetleri ve yüksek pazar fiyatları olan ürünler elde etmek istemektedir. Bölgeye uygun rotasyon sisteminin belirlenmesinde bölgede adaptasyonu yüksek çeşitlerin belirlenmesi oldukça önemlidir. Üreticilerin bilgi düzeyleri ve alışkanlıkları üretim yöntemlerinin belirlenmesinde etkilidir. Üretilen ürünlerin fiyatları yıldan yıla ve üreticilerin gelirleri değişmektedir. Tarımsal üretim yapan çiftçiler rotasyona uygun rotasyon sistemlerini ve tahılları seçmelidir. Bu çalışmanın amacı; üreticilerin tarım alanında yüksek uyarlanabilirliği belirlemesini sağlamak ve tahıl üreticisi, çalışmalarının yerini belirterek rotasyon sisteminin belirlenmesine yardımcı olmaktır. Ülkemizde ve dünyada rotasyon konusunda birçok çalışma yapılmış ve yapılan araştırmalar sonucunda önemli sonuçlar elde edilmiştir.

Anahtar Kelimeler: *Tahıllar, Bitki, Kalite, Rotasyon, Rotasyon teknikleri, Verim.*

1. Introduction

Grains are plants belonging to the Gramineae family. Grains constitute a large part of the areas that are processed in Turkey. The reason for this situation is that, besides the favorable climate and soil characteristics for grain agriculture, grains constitute the basis of human and animal nutrition. Cereals contain high levels of carbohydrates. They contain protein and low amounts of fat [1]. Most of the world's population meets their daily energy needs from grains. Grain agriculture is also preferred because it is very suitable for machine use. The use of machinery is easier and widespread than other agricultural products in all processes from plowing to cultivation, fertilization, pesticide and harvesting

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of the field. On the other hand, the fact that it is easier to transport than other plants and can be stored for a long time during the period from harvest to storage and storage are also factors that encourage

grain agriculture [2]. Cereals have a very rich species and variety. Therefore, it can be grown easily in many different ecologies. It can be grown in almost every area and altitude from the equatorial zone to the cold zone. Although the climate and soil requirements are generally similar, they are classified under two main headings as cool climate cereals (Wheat, Barley, Rye, Oat, Triticale) and warm climate cereals (Maize, Paddy, Birdseed, Millet) [2].

The study was carried out in order to determine the importance of grains in the rotation system in the world.

2. The Importance of Grains in the Rotation System

Generally, wheat needs an air temperature higher than -5 ^{o}C during sowing and not exceeding 40- 42 ^{o}C during the growing period. Wheat can cultivate from between -10 ^{o}C and -20 ^{o}C. Wheat, which requires relatively moisture in its spike and maturation time, does not have much selectivity in terms of soil demand. Barley, rye, oats, birdseed, etc. It has similar qualities to wheat in terms of climate and soil properties. However, such grains can be grown more easily than wheat in barren soils that receive less precipitation, show low temperature values and are not rich in organic matter [2]. Maize, which is one of the hot climate grains, generally germinates at 9-10 ^{o}C in terms of climate requirements, but needs 20 oC and above during the vegetation period and requires a maximum of 25-30 ^{o}C during the maturation period. Soil requirements in terms of selectivity does not show much like other grains. Unlike other grains, it needs plenty of water during ripening with paddy. When it is drought, it should be watered. Like paddy and maize, the temperature not to fall below 18-20 °C during the vegetation period. During the ripening period, plenty of water water demand must be met. Unlike other grains, rice likes soils rich in organic matter and it becomes difficult to grow in soils with acidic characteristics [2]. By some authors [3] have established the following table reaching a pre-plant research (Table 1, 2).

Table 1. Suitable pre and post crops in crop rotation in field crops

Suitable Pre Plants	***Suitable Post Plants***
Rye	Barley
Oat	Wheat
Maize, Barley, Wheat, Oat	Beet
Barley, Wheat, Maize	Potato
Maize, Barley, Wheat	Peas, Beans, Vetch
Oat, Barley, Wheat, Rye	Alfalfa, Trifolium
Grain	Poppy
Grain	Sunflower
Barley, Wheat	Cotton

Table 2. Pre and post plants that are inappropriate in crop rotation in field crops

Inappropriate Pre Plant	***Inappropriate Post Plants***
Maize	Winter Barley
Maize	Rye
Peas, Beans, Alfalfa	Summer Barley

Effects of crop rotation on various quality parameters of pre-plant applications in different plants. In the study conducted by the researchers [4] in two growing periods between 2009 and 2011, 9 different crop rotation and 4 bread wheat varieties were discussed. The research was carried out with 3 repetitions in divided plots in randomized blocks, and 9 different pre-plant applications such as fallow - wheat, continuous wheat, chickpea, winter lentil, vetch, summer oat, summer lentil, sunflower and safflower were carried out in the experiment. The parameters investigated are grain hardness, flour yield, protein, ash, falling number, gluten, dry gluten, gluten index values. When the results of the analysis of variance combined with the two-year findings were examined, it was seen that all the parameters considered were significant at the 0.01 level. It was stated that Tosunbey variety gave good quality values in preliminary plants. It has been determined that the Eser cultivar can also be used in crop rotation in Anatolian conditions. In general, in this study, it has been understood that the variety has a pre-plant effect, except

for its genetic feature [5]. In a study conducted between 2006-2007, after canola and wheat, the effect of 3 different maize varieties on yield in crop rotation was examined. In the research, in the application of alternation with maize where the front plant is wheat; Parameters such as spadix height, leaf area, spadix weight, number of grains per spadix and grain weight were investigated. In the experiment, which was set up in the random plot trial pattern divided plots, the height of the plants following the canola was significantly higher, and the difference between the maize varieties in the year following wheat was found to be due to genetic characteristics [6]. Examination of the crop rotation in 2000-2002 was conducted in Central Anatolia. Because especially in the Central Anatolia Region, reducing fallow to at least once every four years is only possible by planning a good crop rotation. In the research, the grain yields in wheat cultivation areas were evaluated and the research continued by considering similar characteristics in 12 types of bread wheat-durum wheat and barley. Since the most important feature of the research is the low amount of precipitation, different trials have been established in various provinces. The most important result obtained as a result of the three-year study is that the highest yield was obtained from the fallow-wheat-summer lentil-wheat crop rotation, and the lowest yield was obtained from the fallow-wheat-fallow-wheat [7]. Another parameter that should be controlled in order to evaluate the crop rotation applications in terms of yield and quality characteristics is wild herb control. Today, rotation is the most important method used to increase quality characteristics with wild herb control. The cultivation of various crops in the same areas repeatedly reducing the use of plant protection products on the wild herb populations in this study is very effective in bringing to a minimum. For example, cotton, tomato, corn and wheat plants that are rotated with rice cause a decrease in the important weed species that cause the use of drugs in paddy and increase the quality and yield in paddy. In this context, according to the studies of the researchers [8], as the wild herb species are specialized according to the cultivated plants, the diversification of the crop plants in rotation is also very important in terms of the use of herbicides and the control of wild herb seeds and increases the yield and quality of all the cultivated plants. The fact that nitrogen, which is of great importance for plants and is the most needed but not available in our soils by plants, is the main source of soil organic matter makes it more important. As a result of the decomposition of these substances in 3 different stages with the increase in the rate of organic matter in the soil, the compounds break down up to CO_2 and H_2O. In the meantime, organic substances turn into inorganic substances and substances that microorganisms can use as energy for themselves begin to form. The compounds used as energy sources other than portions will remain in the soil for use by the plant. Organic materials are brought into the soil either by giving them to the soil from outside or by burying the harvested plant residues in the soil. During the period from the harvest to the planting of the other plant, organic substances decompose into necessary compounds. The important issue here is to increase the availability of compounds in other plant-useful forms, so the soil tillage action should be carefully considered in this context. As a result of 17 different experiments conducted by the researchers [9], they concluded that the carbon was found at the highest level in the first 8 cm of the soil. Based on this research, they concluded that the mouldboard plow should not be used as it causes a high loss of carbon and organic matter in order for the successor plant to benefit from organic matter from the plants entering the crop rotation. They determined that the organic matter content at a depth of 0-5 cm decreased depending on the intensity of soil cultivation and that there was 33% more organic matter accumulation in the parcels where the direct sowing method was applied to the stubble [10]. According to the data obtained, due to the presence of organic matter in the soil and its direct effect on microbial mass and microbial activity, it significantly affects all soil properties in general, especially soil properties such as nitrogen cycle, cation exchange capacity, aggregate stability. As a result of the results of the studies, it is recommended to apply protective tillage methods instead of only loosening the soil and traditional tillage methods instead of over-tillage, in terms of the sustainability of organic matter [11]. The common conclusion to be drawn from the researched articles is that one of the most important cultural practices of field agriculture is crop rotation. With the crop rotation, not only are diseases, pests and weeds prepaid, but also the vitality of the soil is increased and maximum benefit is obtained from various layers and indirect erosion is prevented. In addition to, rotation improves the physical and chemical structure of the soil and increases productivity; as a result, it increases the yield and quality of the grown product [12, 13, 14].

3. Results

Important information was given about the plants to be used in rotation (crop rotation), rotation systems,

and the effects of pre and post plants on yield and quality. In addition, the detection of objectionable pre and succession plants (maize-winter barley, maize-rye, pea + bean + alfalfa-summer barley) included in the crop rotation system and the positive effects of the alternation on the soil were mentioned. Positive effects on soil quality and crop rotation systems with high-efficiency plants that quality in the world and Turkey is determined. The grains to be used in rotation systems were mentioned in detail studies. In order to eliminate the negative effects of monoculture agriculture, the alternation systems suitable for the regions should be determined and applied systematically. While planning the rotation system with plants with high adaptability; characteristics of plant species and varieties, soil structure, climatic conditions, weed, disease and pest, spreading status, transportation, storage and marketing characteristics must be taken into consideration. Workforce planning can be made in enterprises with alternation. During the vegetation period of the plants, operations such as planting, care, harvesting, threshing and pre-planting soil preparation processes will be able to be efficiently applied without interruption. As a result, it is possible to reduce operating costs, minimize the risks that may occur and ensure maximum efficiency and quality with appropriate rotation techniques.

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