AGRONOMY

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INTRODUCTION

In the broad area of improving crop production inputs of most agricultural crops, and Brassica crops in particular, the requirement of competent knowledge of agronomical measures is vital for a satisfactory yield level and for production stability. The very best agronomy inputs are, however, closely connected to the plant material and the influence of the climate and the environmental growing conditions. Increased knowledge about different production factors in agronomy and the optimum combination of these factors e.g. seed-bed preparation, crop rotation, sowing-time, seed rate, row space, fertilizers, weed control, pests, diseases, harvest, storage, has made the Brassica crops considerably more competitive with other crops and has enabled them to become adapted to growth in a wider area.

SEED AND PLANTING

Seed of genetic purity and high viability should be the appropriate strategy for obtaining a high production of seeds that could be primarily used for oil and protein. From studies of certified seed undertaken in Canada, yield differences depending on poor seed have been clearly identified.

To ensure good establishments, the Brassica crop requires a carefully prepared seed bed. In the germination of the small seeds of rapeseed the soil temperature, soil moisture content and sowing depth are vitally important parameters.

The methods used for seed-bed preparation vary widely, and should mainly depend on moisture availability and soil type. A study was reported from U.K. where the winter rapeseed crop was established by broadcasting seed into the standing cereal crop.

The ideal time for sowing a Brassica crop to obtain maximum yield is found to be extremely specific to the growing region. This production factor has been thoroughly penetrated in most rapeseed growing countries. It is considered of greatest importance in evaluating the potential of the rapeseed crop in new regions e.g. U.S.A., U.S.S.R. and Argentina, as well as in expanding areas with new quality varieties where the rapeseed crop can consistently produce competitive yields.

Studies undertaken where Brassica was grown with different stand densities have clearly demonstrated that an even distribution of plants over the soil surface must be aimed at. In some cases the optimum combination of row space and seed rate for achieving maximum seed yield per hectare could not be obtained owing to the design of the sowing machinery. However, interactive effects between row space and seed rate that normally contribute to increased yield are often found.

Rapeseed, like many other commercial crops, reacts to an increased rate of nitrogen fertilizer with increased biomass production and increased yield. It is also known that the additional yield will decrease as the level of nitrogen increases. It is estimated that the maximum uptakes of the three major nutrients by a winter Brassica crop were 364 kg/ha N, 43 kg/ha P and 308 kg/ha K during the whole growing season. There are indications that the nutrient uptake by the crop is linked to a dynamics of different nutrients involved (France, Germany, China, India, Australia).

Environmental stresses are highly applicable to Brassica crops as these crops are distributed over a wide area of the world with considerable variation of climate and soil. In recent years, it has been well documented how the rapeseed crop is moving into new growing areas with an increasing occurrence of limiting growing factors. Typical stress factors are drought and frost, which are responsible for causing severe damage at leaf, flowering or pod filling stages, or total spoilage of Brassica crops. However, researchers are tackling these problems, and by simulating drought and frost it has been possible to obtain a wide range of good results. These have then been used to exploit crop development for high production capacity and yield stability under certain environmental constraints.

PESTS AND DISEASES

The Brassica crop is exposed to a large number of insect pests and diseases.

The intensity of damage varies from region to region, mainly depending on the specific climatic conditions of the growing site and the applied cropping systems. Apart from the quantitative losses, diseases also cause deterioration in the quality of the harvested products.

At present, cultivation of resistant or tolerant rapeseed varieties is one of the most important methods of pest and disease management. Over the years a great number of improved lines and varieties have been released, but the visible impact to the average productivity of the Brassica crops is limited. This might depend on the new lines being highly susceptible to pests and diseases. Therefore, varieties should be developed with multiple resistance against the major pests and diseases in combination with good agronomic quality enabling them to be suitably adapted to different agro-climate regions.

Biological control of pests and diseases is the best method to use, if available, and provided it has been tested and is applicable to the rapeseed growing area. For example, the fungus Nectria inventa is reported to be a destructive parasite of Alternaria blight (Alternaria brassicae). When the fungus comes into contact with the host, the hyphae form appressorium-like bodies in the cell of Alternaria blight, and start producing adhesive material at the host-parasite interface.

Pesticide use is another effective method of pest and disease management. Modern chemical control methods used to control various pests are most effective instruments. However, before the pesticide is recommended for field application, its efficacy must be critically evaluated under field conditions, considering not only the nature of the host and parasite involved but primarily the influence on soil and environmental factors as well as residual toxicity.

Nonetheless, it should be stressed that a healthy rapeseed crop is capable of withstanding considerable damage by pests but the situation is often made worse when the plant stand becomes weakened by different stresses, e.g. poor soil conditions, drought, frost, weed competition.

The papers presented include interesting and valuable results concerning control problems of pests and diseases (Ceutorhynchus spp, Lipaphis spp, Myzus spp, Plutella spp, Athalia spp, - Sclerotinia spp, Alternaria spp, Leptosphaeria spp, Cylindrospoeium spp, Peronospora spp,). Important new information is given on forecasting, prognosis systems, mechanisms of resistance and economic thresholds.

CROP MODELLING

Agronomy is often said to be the science of crop management for greatest benefit. Understanding the different factors involved and their interactions into verifying and demonstrating the effects to the farmers has a great impact. Modern agriculture of today requires a more specific knowledge of this rather complex mechanism of food production and particularly with regard to the influence of climate and soil conditions.

Projects on modelling agricultural crops to get information about the complex interactions between the crop and inputs of different cultivation techniques have been conducted. So far very few model studies with Brassica crops have been initiated. However, a new methodology of modelling was recently developed with the intention to describe the whole crop production process as the individual relationships behind various parts of the process. The findings will give information about the critical point of the plant development stage with regard to a specific factor damage and will be a useful instrument for data analysis, research planning, education and a means for predicting seed quantity and quality or the best harvesting time (France, Sweden).

HARVESTING AND STORAGE

The time and method of harvest are two factors grouped under the heading of cultivation technique which are found to have great influence on seed yield and quality. By following how the variation of these important parameters becomes established during the ripening process of Brassica crops, it has been possible to demonstrate that seed quality is stabilized at an acceptable level at 30-40 per cent moisture of the seed. When the swathing harvesting method was carried out before 30-40 per cent moisture in the seed has been reached the result was a lower oil content and smaller seeds.

During and after harvest the seed should be handled in such a way that damage is avoided. An appropriate handling system is important for obtaining high quality seed as a basis for ensuring a high-quality end product.

CONCLUDING REMARKS

Today there is a need for scientific approaches that can improve investigations in agronomy in which the most essential production factors could be studied in combination with ecological factors. Therefore, greater emphasis should be placed on more detailed studies of the field agro-climate and the micro climate in the plant stand in relation to crop simulation investigations in the laboratories e.g. phytotrones or growth chambers. Such arrangements should have the intention of facilitating the evaluation of crop production under varying controlled conditions.