# AGRONOMIC PRACTICES FOR CANOLA GROWN IN SOUTH CAROLINA, USA

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## INTRODUCTION

Canola (Brassica napus) is a new crop to South Carolina which has the potential of being the most important "new" crop to the region since soybeans. Sixty years ago soybeans were not known in the state, yet today they are planted on more land than any other row crop. Factors which make the future of canola production in South Carolina promising include favorable climatic conditions for double cropping, existence of oil processing facilities in the region, and projected increase in domestic demand for the oil.

## RESEARCH AND EXTENSION EFFORTS

Research with rapeseed and canola has been ongoing in South Carolina since 1982 (Sojka and Karlen, 1988). However, only since 1989 have studies other than variety evaluations been conducted. Extension efforts with the crop began with a canola workshop in early 1989, and annual field days have been held since then. In 1990 a Clemson University extension circular on canola production in South Carolina was available to producers (Porter et al., 1990).

Commercial production of canola in South Carolina started in 1989-1990 with a handful of producers planting a total of 120 hectares. Favorable growing conditions that season resulted in good yields and a generally positive outlook toward the crop. In 1990-91 total acreage of canola increased to over 1,200 hectares, with perhaps as many as 100 producers growing the crop. Initial canola plantings were a direct result of promotional meetings held in counties throughout the state by the combined effort of the seed, marketing and crushing industries.

The majority of Clemson University's canola research occurs near Blackville, but plots are also located at research stations near Clemson and Florence (Fig. 1).

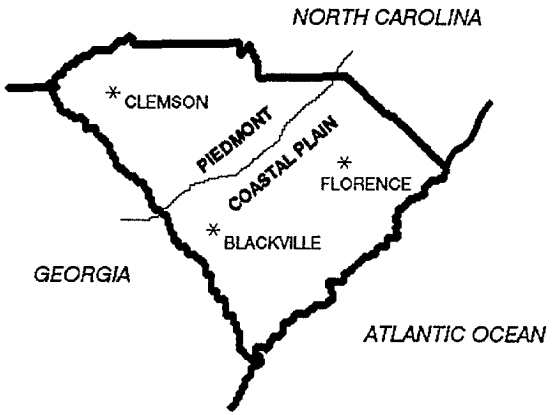


Fig. 1. Location of canola research in South Carolina and major soil regions.

## CROPPING SYSTEMS

The area of land planted annually to soybean, winter wheat, corn, and cotton in South Carolina averages approximately 325,000, 160,000, 140,000 and 60,000 hectares, respectively. Other important row crops include peanuts and tobacco, with less than 24,000 hectares combined. Since so much agricultural land is winter fallow, increased canola plantings would not necessarily come at the expense of wheat acreage, in spite of the fact that canola could be thought of as an alternative to winter wheat in rotation with summer annual crops.

Virtually all wheat is double cropped with soybeans. Wheat is planted during the month of November and harvested in early June. Limited research with canola suggests planting from mid- to late-October on the Coastal Plain gives the best yield (Porter et al., 1990).

Canola harvest ranges from mid-May through June depending on the cultivar planted. Early maturing canola varieties could be followed by soybean and perhaps cotton and peanuts. Thomas et al. (1990) discuss the feasibility of a canola-peanut double cropping system in southeastern United States.

Harvest dates of the major summer crops don't necessarily restrict which crops can be followed by canola. Corn harvest extends through September, while cotton and soybean harvest begin in October and can extend into December. The most likely place for canola in South Carolina cropping systems is after corn, peanuts, tobacco and perhaps cotton and soybeans. For reasons discussed later, canola should not be planted on land planted to canola or other Brassica crops in the previous four years.

## CLIMATE

Winter temperatures in South Carolina seldom fall below -12°C, and canola winter kill is not expected to be a problem most years (Table 1). Wide temperature swings in the spring are not uncommon. At Blackville in 1990 temperatures above 27°C were recorded 10-17 March, while temperatures below 0°C were recorded on 20 and 21 March. Canola varieties must be developed which can tolerate such fluctuations.

Table 1. Temperature and precipitation at major research locations in South Carolina[(1)].

| Month | Edisto (Ed) Monthly Avg. | Edisto (Ed) Record Low | Clemson (Cl) Monthly Avg. | Clemson (Cl) Record Low | Florence (Fl) Monthly Avg. | Florence (Fl) Record Low | Ed Monthly Precipitation | Cl Monthly Precipitation | Fl Monthly Precipitation |
|---|---|---|---|---|---|---|---|---|---|
| | °C | | | | | | cm | | |
| Oct. | 18.0 | -14 | 16.3 | -5 | 17.7 | -3 | 6.1 | 9.4 | 6.0 |
| Nov. | 12.9 | -17 | 10.8 | -10 | 12.7 | -8 | 5.7 | 9.3 | 5.6 |
| Dec. | 8.9 | -16 | 6.6 | -17 | 8.4 | -13 | 9.1 | 11.8 | 7.6 |
| Jan. | 7.8 | -15 | 5.5 | -18 | 7.2 | -12 | 10.3 | 13.0 | 9.0 |
| Feb. | 9.0 | -14 | 6.9 | -17 | 8.4 | -11 | 10.7 | 12.4 | 8.6 |
| Mar. | 13.2 | -13 | 10.8 | -16 | 12.6 | -12 | 12.6 | 16.9 | 10.6 |
| Apr | 17.8 | -2 | 16.0 | -4 | 17.6 | -1 | 9.0 | 12.0 | 7.4 |
| May | 21.9 | 2 | 20.2 | 1 | 21.9 | 3 | 10.6 | 10.9 | 8.4 |
| June | 25.1 | 8 | 23.9 | 7 | 25.2 | 8 | 13.4 | 10.6 | 11.8 |

[(1)]Monthly average temperatures, the extreme low temperatures, and the monthly precipitation values are from the past 50 years.

## CULTIVAR SELECTION

At present no canola cultivars have been developed specifically for production in the southeastern United States, however, cultivars with acceptable performance have been identified. On the Coastal Plain in South Carolina cultivars developed for spring planting in Canada and northern Europe have been successfully grown when fall planted. Seed yields have ranged from 2,000 to 3,000 kg $ha^{-1}$. At Blackville the spring cultivars out yield the traditional biennial or winter cultivars (Table 2), with yields comparable to those obtained in Tifton, Georgia (Raymer and Thomas, 1990). Winter cultivars currently available to South Carolina producers appear better adapted for the Piedmont because these cultivars may have inadequate vernalization and suffer from heat stress during seed fill when grown on the warmer Coastal Plain.

Table 2. Seed yield of selected canola cultivars grown at Blackville, SC.

| | 1987-1988 | 1988-1989 | 1989-1990 | | 1989-1990 |
|---|---|---|---|---|---|
| | ---------- kg $hg^{-1}$ ---------- | | | | kg $ha^{-1}$ |
| Industrial rapeseed | | | | | |
| Bridger | 1294 | 2117 | 2439 | | |
| LEI-III | | 1587 | 2361 | | |
| Winter cultivars | | | | Spring cultivars | |
| Aspen | | 2492 | 2487 | AO325 | 3190 |
| Bienvenu | 1216 | 1350 | 1992 | AO449 | 3250 |
| Cascade | 1062 | 2056 | 2512 | AO452 | 3010 |
| Crystal | 1211 | 1468 | 2334 | AV154 | 2830 |
| Glacier | 1674 | 1253 | 2743 | Comet | 2760 |
| Rebel | | 2099 | 2645 | Delta | 2920 |
| Shenandoah | | 2176 | 2792 | K 42-87 | 2690 |
| Stonewall | | 2222 | 2565 | K 255-88 | 3170 |

## FIELD SELECTION AND FERTILITY

Most South Carolina small grain producers would not have to purchase any new equipment in order to plant and harvest canola. Row spacings of 20 to 30 cm are preferred over wider row spacings because the narrower rows result in more rapid ground cover and better weed suppression. Deep tillage is especially important on the sandy textured Coastal Plain soils which are prone to soil compaction. Although only limited research has been conducted in the southeastern United States on land preparation for canola, data from elsewhere suggest that reduced tillage is not recommended and that planting on poorly drained soils should be avoided.

Trifluralin is the only herbicide labeled for use in South Carolina for weed control in canola. While trifluralin is effective in control of many winter grasses, it does not control several important broadleaf weeds. Fields infested with wild radish (Raphanus raphanistrum) and wild mustard (Sinapis arvensis) are common in the state. Since these weeds can not be controlled in canola with existing registered herbicides, fields with a heavy infestation of wild radish and wild mustard should be avoided. Canola is also susceptible to carryover injury from certain commonly used crop herbicides. Until herbicide tolerant cultivars or new selective herbicides are available to adequately control weeds, the problems associated with weeds will pose a major restriction on acceptance of canola by producers.

Preliminary results from nitrogen studies conducted at Blackville indicate yield responses at rates up to 225 kg $ha^{-1}$. Current nitrogen recommendations are 35 kg $ha^{-1}$ at planting and 100 to 120 kg $ha^{-1}$ in early spring before stem elongation. Boron, applied at 1.7 kg $ha^{-1}$ as a foliar spray, has also been shown to increase yields (Porter and Robinson, 1990). No research in South Carolina has yet been conducted on the response to applied phosphorus, potassium, and sulfur -- all of which are important for optimum yields (Grant and Bailey, 1990).

## DISEASES, INSECTS AND NEMATODES

While Sclerotinia stalk rot (Sclerotina sclerotiorum) and powdery mildew (Erysiphe cruciferarum) have been observed, to date black rot (Xanthomonas campestris) and black leg (Leptosphaeria maculans, imperfect stage Phoma lingam) have not been identified on canola in South Carolina (Porter et al., 1990). Use of fungicide treated seed will retard the appearance of the latter two diseases in the state. A strict crop rotation of planting canola and other Brassica crops no more than once every four years on the same land is recommended to reduce problems associated with weeds and diseases.

The cabbage aphid (Brevicoryne Brassicae) and the cabbage seedpod weevil (Ceutorhynchus assimilis) have been observed on canola in the Coastal Plain at levels which probably reduced yields. In South Carolina an insecticide has been given a 24-C label for use on canola to control these insects in cases of severe infestation. Foliar feeding insects such as diamondback moth (Plutella xylostella) and cabbage looper (Trichoplusia ni) may be controlled with certain Bacillus thruingiensis insecticides.

Canola is susceptible to root knot nematodes (Meloidogyne spp.) and it is possible canola could maintain a nematode population level which could damage subsequent crops (Raymer and Thomas, 1990).

## HARVESTING AND RESIDUE MANAGEMENT

The South Carolina producer will, in most instances, direct combine canola. The optimum seed moisture at harvest is 8 to 10%. Timing of harvest is critical. If done too early, heavy dockage due to high moisture, green seed, and high foreign matter may result. Harvesting too late may result in excessive losses due to shattering. Wet conditions, which would limit the ability to harvest at the appropriate time, is a major concern. If drying facilities are available to the producer, harvest could begin when the seed moisture is 15%.

The small seed size will require special attention when harvesting and handling canola. Proper combine adjustment and plugging holes in storage and transporting equipment are necessary to minimize losses.

Preliminary data from research conducted at Blackville on canola residue management in double crop situations indicate that soybean planted directly into standing canola residue yielded just as well as soybean planted into canola residue that had been mowed. However, the soybean yield was significantly reduced when the canola stubble was disked. The study was conducted during a very dry year and it is likely the loss of soil moisture due to disking contributed to the yield reduction when canola stubble was disked.

## CANOLA AND THE 1990 FARM BILL

The 1990 Farm Bill, which was signed into law too late to effect the 1990 canola planting in southeastern United States, may alter crop production from 1991-95 by providing program provisions that allow increased planting flexibility enabling producers to better respond to market signals when making planting

decisions. The bill gives new incentives for encouraging production of alternative crops such as canola without losing acreage base. Specifically, the 15% triple-base provision along with the oilseed marketing loan and "0/92" program will encourage the production of crops such as canola.

Unfortunately, the bill may not allow soybean to be double cropped after canola on "0/92" land. That combination would have made canola extremely competitive. However, planting canola on "0/92" land and not double cropping appears to be an economically viable option. It is conceivable that on "0/92" land there could be a place for later-maturing canola cultivars with higher yield potential than the cultivars developed for the canola-soybean double crop system.

## SUMMARY

Producers in South Carolina are similar to producers around the world in that they approach new crops with caution. They realize canola is not a miracle crop to replace all other crops. If problems concerning diseases, insects, weeds and harvest can be adequately addressed there is little doubt the favorable growing conditions will enable canola to fit into the varied cropping systems employed in the state.

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