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those of leading southeastern cultivars, but they have fibers that are 18% stronger. These two breeding lines differ significantly in fiber properties. Pee Dee 9232 is equivalent to 'Coker 201' in fiber length and micronaire, but Pee Dee 9223 is superior to them.

Pee Dee 9241 was developed from the cross of Coker 421 × PD 4398. Pee Dee 4398 was developed from the cross of FTA 263 × 'Atlas'. FTA 263 was developed from a complex series of crosses involving Triple Hybrid 108 and 171, AHA 6-1-4, Earlistaple, and Sealand 542 in the Pee Dee breeding program. Atlas was developed from related material in the Georgia Agricultural Experiment Station cotton breeding program. Pee Dee 9241 is from the increase of seed from a single F_3 plant selection.

Pee Dee 9241 possesses excellent fiber properties with unusually high fiber elongation. It combines well with other PD lines and gives excellent combinations of fiber quality and yield. Pee Dee 9241 is extremely susceptible to the fusarium-wilt (caused by *Fusarium oxysporium* F. spp. *vasinfectum*) rootknot-nematode complex (*Meloidogyne* spp.), and to verticillium wilt (caused by *Verticillium* spp.).

Pee Dee 9363 and Pee Dee 9364 were developed from a complex composite cross involving 'Carolina Queen', Triple Hybrids 108 and 171, AHA 6-1-4, Earlistaple, Sealand 542, and C 6-5. Each line is from a single F_3 plant selection.

Pee Dee 9363 and Pee Dee 9364 produce yields equivalent to Coker 201, but their fibers are 20% stronger. Other agronomic and fiber properties of Pee Dee 9363 are equivalent to Coker 201, but those of Pee Dee 9364 are superior.

These five breeding lines are derived from crosses with southeastern commercial cultivars, Coker 421, Atlas, and Carolina Queen. Although numerous crosses of this type have been made, this is the second series of crosses that have led to improved breeding lines. Studies indicate the success in breaking the genetic linkages that control the negative association between lint yield and fiber strength.[4]

Seed (25 g) of these breeding lines may be obtained from AR, SEA, USDA, Pee Dee Experiment Station, Florence, SC 29503.

[1] Registered by the Crop Sci. Soc. Am. Published as Journal Paper 1634 of the South Carolina Agric. Exp. Stn. Accepted 2 July 1979.

[2] Research agronomist and research agronomist (retired) AR, SEA, USDA, Pee Dee Experiment Station, Florence, SC 29503.

[3] Harrell, D. C., T. W. Culp, W. E. Vaught, and J. B. Blanton. 1974. Recent breeding progress in improving lint yield and fiber quality in PD lines of upland cotton (*Gossyipum hirsutum* L.). South Carolina Agric. Exp. Stn. Tech. Bull. 1052.

[4] Culp, T. W. 1977. Recent genetic changes in the lint-yield fiber-strength association in cotton. Agron. Abstr. p. 53.

REGISTRATION OF PEE DEE 4461 COTTON GERMPLASM[1]

(Reg. No. GP49)

T. W. Culp and D. C. Harrell[2]

THE unique breeding stock of cotton (*Gossypium hirsutum* L.), Pee Dee 4461 (GP 49), was released to plant breeders and geneticists by AR, SEA, USDA, and the South Carolina Agricultural Experiment Station in 1974. This breeding stock possesses extra fiber quality, is an excellent combiner for yield and fiber strength, and carries unidentified factors for resistance to *Heliothis* spp.

Pee Dee 4461 was developed in a complex backcrossing and composite-crossing (CC) program to transfer the high lint percentage of a *G. barbadense* L. strain to upland cotton (1). Other parental material involved was 'Earlistaple', 'Auburn 56', and 'Coker 100 Wilt'. Pee Dee 4461 was an unusual CCF_3 selection with light green plant color essentially devoid of red pigment, compact plant type, and unusual prolificacy of small bolls. It was tested under the experimental label Q_1.

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[2] Research agronomist and research agronomist (retired), AR, SEA, USDA, Pee Dee Experiment Station, Florence, SC 29503.

Although Pee Dee 4461 produces low lint yields and has unusually small bolls and seed compared with these traits in southeastern cultivars, the breeding stock has high lint percentage and excellent fiber properties. It combines well with many commercial cultivars and breeding lines (1) giving heterosis for lint yield of 15 to 20% over the superior parent and transmitting a 15% increase in fiber strength from *G. barbadense* to its progenies.

Pee Dee 4461 was the common parent in several crosses that produced progenies resistant to *Heliothis* spp. (2, 3). This source of resistance to *Heliothis* spp. has not been isolated or identified, but Pee Dee 4461 must possess resistant factors. Preliminary studies suggest that cultivars with insect resistance require less insecticide or fewer applications for *Heliothis* spp. control, which can make cotton a more profitable crop and give a cleaner environment in which to live. Seed (25 g) of this breeding line may be obtained from AR, SEA, USDA, Pee Dee Experiment Station, Florence, SC 29503.

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REGISTRATION OF PEE DEE 6520 GERMPLASM LINE OF COTTON[1]

(Reg. No. GP50)

T. W. Culp and D. C. Harrell[2]

PEE DEE 6520 (GP 50), a very early maturing breeding stock of cotton (*Gossypium hirsutum* L.) with extra fiber strength, was released by AR, SEA, USDA and the South Carolina Agricultural Experiment Station in 1974. This breeding line represents a major improvement in lint yield and maintains a portion of the extra fiber strength of its parents.

Pee Dee 6520 was developed from a composite cross of two F_1 hybrids, (FTA 266 × 'Atlas') × (AC 235 × 'Dixie King'). FTA 266 was developed from a series of complex crosses involving Triple Hybrids 108 and 171, 'Earlistaple', 'Sealand 542', and AHA 6-1-4. AC 235 was derived from similar crosses that included C 6-5. Atlas, a commercial cultivar of Triple Hybrid origin, was developed at the Georgia Coastal Plain Experiment Station. Dixie King, a conventional southeastern commercial cultivar, was developed by the Bobshaw Pedigreed Seed Company, Stoneville, Miss. Pee Dee 6520 was derived from the increase of seed from a single F_3 plant selection.

Pee Dee 6520 produced yields comparable to 'Coker 201' at the Pee Dee Experiment Station and erratic yields in the 1968 and 1969 Regional High Quality Tests, primarily because its locks are too loose in the open bolls and fall out when harvest is delayed. This breeding stock is intermediate to Pee Dee 2165 and Coker 201 in fiber quality and yarn strength.

Pee Dee 6520 is early maturing and its compact plant type is advantageous when above-average plant populations are tested[3]. It also performs above average as an early season cotton in the Southeast.

Pee Dee 6520 has given above-average performances in tests where yields are influenced by injury from boll weevil (*Antho-*

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[2] Research agronomist and research agronomist (retired), AR, SEA, USDA, Pee Dee Exp. Stn., Florence, SC 29503.

[3] Culp, T. W., D. C. Harrell, and J. B. Pitner. 1974. Population studies with cotton (*Gossypium hirsutum* L.). South Carolina Agric. Exp. Stn. Bull. 575.

nomus grandis grandis Boheman); bollworm (*Heliothis zea* Boddie); or tobacco budworm (*H. virescens* Fab.). Its superior performance may be due to rapid fruiting and a shorter exposure of tender fruiting parts to insect attacks. The prolific nature of Pee Dee 6520 may partially compensate for insect injury to fruiting parts, because they are replaced more rapidly in this line than in other cultivars. Seed (25 g) of this breeding stock may be obtained from AR, SEA, USDA, Pee Dee Experiment Station, Florence, SC 29503.

REGISTRATION OF PEE DEE 8619 GERMPLASM LINE OF COTTON[1]

(Reg. No. GP51)

T. W. Culp and D. C. Harrell[2]

PEE DEE 8619 (GP 51), a breeding line of cotton (*Gossypium hirsutum* L.), was released by AR, SEA, USDA and the South Carolina Agricultural Experiment Station in 1978. This breeding line represents a major improvement in lint yield and fiber quality.

Pee Dee 8619 was developed by pedigree selection from the cross of Pee Dee 4461 × 'MO-DEL'. Pee Dee 4461 (Q_3) was developed from a series of complex backcrosses and composite crosses of a *G. barbadense* L. strain with high lint percentage, 'Earlistaple', 'Coker 100 Wilt', and 'Auburn 56'. MO-DEL was also derived from a series of complex crosses involving 'Pandora', 'Early Fluff', Cook-Empire-Tanguis, TH 108, Auburn 56, and Auburn 56-5174 at the Missouri Agricultural Experiment Station. Pee Dee 8619 is from the increase of seed from a single F_3 plant selection.

Pee Dee 8619 produced erratic yields at some locations during early testing in Georgia and South Carolina, but these yields generally equaled those of 'Coker 201'. Yields were intermediate in the 1971 Regional High Quality Cotton Variety Test, but they were equivalent to yields from commercial checks tested in the southeastern region.

Pee Dee 8619 possesses excellent fiber quality in the medium fiber length range, with a significant increase in fiber and yarn strength over the check cultivars. It has produced some unusual combinations of lint yield, fiber strength, and fiber elongation in crosses with other Pee Dee lines and southeastern cultivars (1).

Pee Dee 8619 also possesses an unidentified source of resistance to *Heliothis* spp. (2, 3). Injury to squares and the number of live worms per 100 squares is generally half that on the commercial check cultivars; but, yields generally have been significantly reduced by the extremely heavy insect infestations that develop in host-plant resistance studies. In 1977, Pee Dee 8619 produced 1,727 kg/ha of seed cotton compared with 550 and 809 kg/ha for 'Stoneville 213' and 'Deltapine 16', respectively, when tested under a low rate (0.056 kg AI/ha) of synthetic pyrethroid insecticide applied at 5- to 7-day intervals from 12 July to 13 September. Because yields produced with a high rate (0.168 kg AI/ha) of synthetic pyrethroid have been similar, a savings of $74.00/ha is possible with this resistant line. Seed (25 g) of this breeding line may be obtained from AR, SEA, USDA, Pee Dee Experiment Station, Florence, SC 29503.

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[2] Research agronomist and research agronomist (retired), AR, SEA, USDA, Pee Dee Exp. Stn., Florence, SC 29503.

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REGISTRATION OF EIGHT TRIPLOID HOP POLLINATORS[1]

(Reg. No. GP 6 to GP 13)

Alfred Haunold, C. E. Horner, and Gail B. Nickerson[2]

POLLEN production and synchronization of flowering dates of male and female hop plants (*Humulus lupulus* L.) are important considerations for achieving sufficient yield stimulation in seeded hop yards. Unfortunately, these factors are frequently overlooked by hop growers who plant male hops in their fields to boost yields.

The feasibility of using triploid pollinators for yield stimulation of female hop cultivars was demonstrated previously (2, 4). Under commercial conditions in Oregon, a yield increase of 30% over the unseeded control was achieved with only a moderate increase in production of undesirable seeds. The higher yield was due to increased cone weight and size, particularly of the bract-, bracteole-, and rachis-(strig) components of the cones (4).

Eight triploid (3x = 30) male hop genotypes from two genetic backgrounds (Table 1) were developed cooperatively by AR-SEA-USDA and the Oregon Agricultural Experiment Station. They are suitable for cone yield stimulation and reduced seed set of medium to late flowering hop cultivars under Oregon conditions. The eight genotypes are vigorous, monoecious but predominantly male genotypes. Their flowering branches (side arms) are normally 30 to 120 cm in length and they produce large numbers of male flowers. Occasionally at the end of a side arm or secondary lateral, a female flower develops into a cone. Cone production, however, is negligible; less than 30 cones per plant are typically produced.

All eight genotypes are good pollen producers and are resistant to downy mildew crown infection caused by *Pseudoperonospora humuli* (Miy. et Tak.) G. W. Wils. (Table 1). Genotype 21104M was rated as moderately resistant to downy mildew infection in a replicated greenhouse test, but has been free of downy mildew crown infection in field plots near Corvallis for the past 6 years.

The eight pollinators have two different genetic backgrounds (Table 1). Genotypes 21102M, 21104M, 21105M, and 21106M originated from crosses made in 1967 on a colchicine induced tetraploid 'Fuggle' (3). The other four genotypes originated from open-pollinated seed collected on two tetraploid sister selections obtained from open-pollinated seed collected on the triploid cultivar USDA 56008 in 1967.

The eight genotypes differ in time of pollen shedding as indicated in Table 1. Genotypes 21104M and 21105M flower late, with peak pollen shedding between 18 and 30 July near Corvallis, Ore. They would, therefore, be suitable to pollinate the last phase of late-flowering female cultivars such as 'Brewer's Gold'. Genotypes 21106M, 21176M, and 21177M near Corvallis shed their pollen about 12 to 18 July and they are suitable pollinators for medium-late flowering cultivars such as 'Bullion' and 'Cascade' and early flowering Brewer's Gold plants. Genotypes 21102M, 21175M, and 21178M flower about 5 to 7 days earlier than the previous group and are suitable to cover the initial flowering phase of medium-late cultivars and also the last portion of early flowering cultivars such as Fuggle (5 to 15 July).

To achieve good pollen supply in commercial hop yards during the 2 to 3-week flowering range of most female cultivars in Oregon, growers should plant males whose flowering coincides with the maximum receptiveness of the target cultivar. They should also plant some pollinators to cover early- or late-blooming plants in the field. For medium to late maturing hop cultivars in Oregon, this choice is available from pollinators listed in Table 1.

Mature leaves of genotypes 21102M, 21104M, 21105M, and

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