

家蚕抗氟品种“桂蚕 F95”的选育研究*

Breeding of a Fluorine-resistant Silkworm Race “Gui Can F95”

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摘要: 2000~2003年利用广西蚕业技术推广总站贮备和引进的品种材料,通过杂交、选育、添食高浓度 NaF 配合力测定选择亲本,开展杂交组合的组配,添食高浓度 NaF 筛选、耐氟实验鉴定和氟化物重污染蚕区农村鉴定,选育出强健、适合广西乃至热带、亚热带蚕区饲养的夏秋用耐氟品种,并于 2007年 4月由广西农作物品种委员会定名为“桂蚕 F95”。“桂蚕 F95”在桑叶氟化物含量正常的情况下,主要经济性状与对照种“两广二号”相仿或略有提高,繁育性能良好;在添食 NaF 鉴定中,从 4龄第 2口叶开始至 5龄第 4天止,用 300mg/kg NaF 溶液浸泡 10min 晾干后的桑叶饲养(桑叶含氟量 150~280mg/kg)的结茧率为 94.83%、虫蛹率 90.63%,万头产茧量 15.398kg,万头茧层量 3.334kg,分别比对照“两广二号”提高 56.80%、60.83%、194.64%、206.43%,表现出较强的抗氟性;在氟化物污染严重蚕区(桑叶含氟量 200mg/kg 左右)的农村试养鉴定中,张种单产 35.417kg,比现行“两广二号”单张产茧量增加 28.40kg,增产 404.87%。

关键词: 家蚕 品种 抗氟 桂蚕 F95

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Abstract With the silkworm variety which were stored and introduced by the general station of sericulture technology popularization of Guangxi Autonomous Region, a new hybrid silkworm race was bred through crossing, selection, feeding with high NaF solution, combining ability test for selecting parent, and composing cross combination, screening by fed high NaF solution, fluorine tolerance test for identification and rearing in heavy fluorine pollution area for countryside identification in 2000~2003, it was a silkworm race for summer-autumn rearing and fluorine tolerance which was healthy and suitable to rear in Guangxi, tropical and subtropical sericulture area, and it was named “Gui Can F95” by Guangxi Crop Variety Committee in April 2007. Under the condition of mulberry leaf which the fluoride content is normal, its main economical character were close or higher than the control race “liangguang er hao”, the propagation character is good. In the rearing NaF identifying test, the silkworm was fed with mulberry leaf which is soaked with 300mg/kg of NaF solution in 10 minutes then air drying from the second mouth of fourth instar larva to the fourth day of fifth instar larva (the fluoride content is 150~280mg/kg in mulberry leaf), the cocooning rate was 94.83%, survival rate was 90.63%, the cocoon crop per 10000 four instar silkworm was 15.398kg and the cocoon shell weight per 10000 four instar silkworm was 3.334kg. Compare the “liangguang er hao” to raise 56.80%, 60.83%, 194.64%, 206.43% respectively, the race showed strong fluorine tolerance character. In the rearing identifying test in the countryside where mulberry leaf was severely polluted by fluoride (the fluoride content was about 200mg/kg in mulberry leaf), the cocoon crop per case of silkworm eggs of “Gui Can F95”

was 35.41kg, which was increasing 28.40kg compare to the silkworm race “liangguang er hao”, the increasing rate was 404.87%.

Key words silkworm, race, fluorine tolerance, Gui Can F95

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以往广西氟化物污染少,家蚕品种研究注重抗高温多湿,抗氟性较弱。近年来,广西由于工厂排放的煤烟、废气得不到充分治理,不同程度地污染环境,污染桑叶,致使蚕儿煤烟中毒,蚕种场、蚕农失收的事故连续发生。广西蚕业生产在久旱无雨的季节及环境污染较严重的地区,普遍受氟化物中毒危害。为了确保广西蚕业不受氟化物污染威胁,确保稳产、优质,广西蚕业技术推广总站从2000年起承担广西“十五”科技攻关项目,开展“热带、亚热带实用抗氟性桑蚕新品种”培育。我们利用本站贮备和引进的品种材料,通过杂交、选育、添食高浓度 NaF 配合力测定筛选亲本,以及开展杂交组合的组配、添食高浓度 NaF 筛选、耐氟实验鉴定^[1]及氟化物重污染蚕区农村鉴定,已经培育成强健,适合广西乃至热带、亚热带蚕区饲养的夏秋用耐氟品种,2007年4月经广西农作物品种委员会审定通过,定名“桂蚕 F95”。

1 亲本来源和选育方法

1.1 亲本来源

96 是本站夏秋用中系品种 932(A),在高添氟饲养环境下经系统选择,提高耐氟性、稳定强健性选育而成。

97 用本站夏秋用中系品种 932(B)作母本,与从广东蚕品种试验所引进的耐氟性较好、抗逆性较强的“东 43”品种作父本进行杂交(932(B)× 东 43),在添氟环境中提高耐氟性、稳定蚕丝质选育而成。

76 用本站强健性夏秋用日系品种 7532(A)作为母本,与从中国蚕业研究所引进的含耐氟主效基因、蚕丝质优的品种“晴”^[2,3]作父本进行杂交和回交((7532(A)× 晴)× 7532(A)),在添氟与人为高温多湿环境中选育而成。

35 用本站强健性夏秋用日系品种 7532(B)作为母本,与引进品种“晴”作父本进行杂交(7532(B)× 晴),在添氟与人为高温多湿环境中选育而成。

1.2 选配经过

以广西“桂夏二号”(932× 7532)强健性高的夏秋用品种为测交种,分别与引进的优良品种和本站贮备和选育品种材料测交,配制成“中× 日”,“日× 中”二元杂交组合,进行配合力预测,然后根据其主要性状的间接和直接配合力表现结果,择优组配“中· 中× 日· 日”四元杂交组合进行实验室鉴定。从30多个杂交组合中,筛选出杂交优势强,耐氟性高,综合性状好,蚕丝质优的杂交组合“96° 97× 76° 35”,并在选育过程中,增加添氟和高温多湿环境进行抗性选择,重视组合中各品种的侧重点、单项性状的提高选择,

促使组合耐氟性、强健性与蚕丝质能达到一个最佳结合^[1,4]。

1.3 选育方法

1.3.1 蛾区重点选育

选择卵量多,不良卵少,卵色基本一致转青齐的蛾区为收蚁蛾区。对已确定的组合的亲本,扩大饲养蛾区,增加选择量。采用同蛾区交配与异蛾区交配灵活使用,交叉进行。1~3龄薄膜全密闭育(全覆盖);4~5龄普通育。

1.3.2 抗氟性筛选

人工设置高温多湿的环境结合用 150~300mg/kg 氟化钠溶液浸泡 10min 的桑叶(桑叶含氟量 150~280mg/kg^[5])全龄添食。在逐渐提高添氟量的饲养环境下筛选出低、中、高强度等级的抗氟品种亲本和组合^[4,6];模仿自然环境氟污染,把 600mg/kg 氟化钠溶液喷在桑树上,用确保含氟量为 200~300mg/kg 的桑叶作为 4~5 龄添食用叶。并定点、定季节在氟污染环境严重的农村饲养,实地筛选,提高蚕的抗氟性能。

1.3.3 高温多湿为主的环境培育

为提高蚕抗高温多湿的能力,采用高温(29~30℃)多湿(90%~95%)为主,与常温(28~29℃),常湿(85%~90%)相结合培育,中系品种偏高,日系品种偏低。

1.3.4 活蛹缂丝手段

为了提高和稳定品种的蚕丝质,在生命率较高的蛾区,选择每区雌雄茧 80 个左右,分雌、雄单茧活缂,从中选留丝长,切断少,类节少的个体继代培育。

1.3.5 留种蛾区和个体选择

以虫蛹率高为基础,以蚕丝量高为重点,结合蚕期发育齐一,眠起、上簇整齐程度,种茧的匀正度,确定留种蛾区,从中选取茧形匀正,茧身结实的雌雄茧各 25 个单茧称,全茧量控制在入选区平均值上 0.1g 左右,茧层量控制在平均值 105% 以上。

2 鉴定及其结果

2.1 省外联合鉴定结果

2.1.1 常规鉴定

2002~2003 年参加中国蚕业研究所、四川蚕业研究所、贵州蚕业研究所、广东蚕种繁殖试验所的实验室省区联合鉴定,在常规桑叶饲养鉴定中,“桂蚕 F95”主要经济性状与对照种“两广二号”相仿或略有提高,详见表 1 和表 2。

2.1.2 添氟鉴定

2003 年 8 月份参与广东蚕种繁殖试验所的添 NaF 鉴定。从 4 龄第 2 口叶开始至 5 龄第 3 天止,用

含氟量 280mg/kg 左右的桑叶饲养。桂蚕 F95 虫蛹率 90.0%, 万头产茧量 15.453kg, 万头茧层量 3.473kg, 分别比对照高 31.26%、69.50%、61.76%。表现出较强的抗氟性, 详见表 2 和表 3

2.2 区内实验室鉴定结果

2.2.1 常规鉴定

2002~2003 年分别在每年的 5 月份和 8 月份由广西蚕业技术推广总站和广西大学农学院进行实验室鉴定。在常规桑叶饲养鉴定中,“桂蚕 F95”的结茧率达 96.64%、虫蛹率 93.57%, 与对照“两广二号”相仿; 万头产茧量、单茧丝长、解舒率、净度等主要经济性状均略高于对照, 详见表 1 和表 2

表 1 2002~2003 两年“桂蚕 F95”常规实验室鉴定结果

Table 1 The results of laboratory identification of “Guican F95” in 2002~2003

| 品种名 (杂交型式) Variety (cross form) | 全龄 经过 Duration of larval stage (d h) | 4龄起蚕生命率 Viability of the fourth instar larvae | | 茧质 Cocoon quality | | | 万头收茧量 Cocoon clop per 10000 silk worms | | 万头茧层量 Cocoon shell weight per 10000 silk worms | | |
|---|---|---|--------------------------------|--------------------------------|---|---------------------------------------|--|-----------------------|--|-----------------------|--------|
| | | 结茧率 Cocooning rate (%) | 虫蛹率 Survival rate (%) | 全茧量 Cocoon weight (g) | 茧层量 Cocoon shell weight (g) | 茧层率 Cocoon shell rate (%) | 实数 Real number (kg) | 指数 exponent (%) | 实数 Real number (kg) | 指数 Exponent (%) | |
| 桂蚕 F95 ^① Guican F95 | 正交 Positive cross | 22 16 | 94.87 | 92.46 | 1.626 | 0.353 | 21.710 | 15.138 | 104.65 | 3.280 | 103.60 |
| | 反交 Reciprocal cross | 22 16 | 95.79 | 93.57 | 1.625 | 0.354 | 21.785 | 15.277 | 106.01 | 3.319 | 104.31 |
| | 平均 Average | 22 16 | 95.33 | 93.01 | 1.626 | 0.354 | 21.771 | 15.346 | 106.29 | 3.300 | 103.97 |
| 两广二号 ^① Liangguang er hao | 正交 Positive cross | 22 15 | 96.93 | 95.34 | 1.520 | 0.333 | 21.908 | 14.465 | 100.00 | 3.166 | 100.00 |
| | 反交 Reciprocal cross | 22 15 | 96.71 | 95.11 | 1.518 | 0.335 | 22.069 | 14.411 | 100.00 | 3.182 | 100.00 |
| | 平均 Average | 22 15 | 96.82 | 95.22 | 1.519 | 0.334 | 21.988 | 14.438 | 100.00 | 3.174 | 100.00 |
| 桂蚕 F95 ^② Guican F95 | 正交 Positive cross | 20 05 | 96.08 | 92.46 | 1.672 | 0.363 | 21.711 | 15.924 | 104.77 | 3.455 | 104.25 |
| | 反交 Reciprocal cross | 20 05 | 97.20 | 94.68 | 1.667 | 0.361 | 21.656 | 15.941 | 105.97 | 3.446 | 105.25 |
| | 平均 Average | 20 05 | 96.64 | 93.57 | 1.670 | 0.362 | 21.677 | 15.932 | 105.36 | 3.451 | 104.77 |
| 两广二号 ^② Liangguang er hao | 正交 Positive cross | 20 05 | 94.62 | 91.01 | 1.622 | 0.354 | 21.825 | 15.199 | 100.00 | 3.314 | 100.00 |
| | 反交 Reciprocal cross | 20 05 | 95.06 | 90.83 | 1.598 | 0.348 | 21.777 | 15.043 | 100.00 | 3.274 | 100.00 |
| | 平均 Average | 20 05 | 94.84 | 90.91 | 1.610 | 0.352 | 21.863 | 15.121 | 100.00 | 3.294 | 100.00 |
| 桂蚕 F95 ^③ Guican F95 | 正交 Positive cross | 22 08 | 97.42 | 93.63 | 1.624 | 0.373 | 22.968 | 15.824 | 105.11 | 3.629 | 102.60 |
| | 反交 Reciprocal cross | 22 08 | 97.70 | 95.48 | 1.608 | 0.365 | 22.699 | 15.652 | 104.91 | 3.554 | 101.22 |
| | 平均 Average | 22 08 | 97.56 | 94.56 | 1.616 | 0.369 | 22.834 | 15.738 | 105.01 | 3.592 | 101.93 |
| 两广二号 ^③ Liangguang er hao | 正交 Positive cross | 22 08 | 98.26 | 94.79 | 1.536 | 0.361 | 23.503 | 15.054 | 100.00 | 3.537 | 100.00 |
| | 反交 Reciprocal cross | 22 08 | 95.43 | 92.40 | 1.556 | 0.366 | 23.522 | 14.920 | 100.00 | 3.511 | 100.00 |
| | 平均 Average | 22 08 | 96.85 | 93.61 | 1.546 | 0.364 | 23.545 | 14.987 | 100.00 | 3.524 | 100.00 |

① 2002.08.11、20收蚁, 外省鉴定。② 2002.05.05、2002.08.08~31 及 2003.05.25、2003.08.12 收蚁, 本站鉴定。③ 2002.08.20、2003.04.12、2003.09.12 收蚁, 广西大学农学院鉴定。

① The collecting of newly-hatched larvae for identification in external province was on August 11 and 20, 2002. ② The collecting of newly-hatched larvae for identification in our station was on May 5 and August 8 to 31, 2002 and May 25 and August 12, 2003. ③ The collecting of newly-hatched larvae for identification in the Agricultural College of Guangxi University was on August 20, 2002 and April 12 and September 12, 2003.

2.2.2 添氟鉴定

2002~2003 年分别在每年的 5 月份和 8 月份由广西蚕业技术推广总站和广西大学农学院进行添食 NaF 实验室鉴定, 从 4 龄第 2 口叶开始至 5 龄第 4 天止, 用含氟量为 150~280mg/kg 的桑叶饲养。对照品种在 4 龄眠蚕开始出现病斑, 5 龄出现大量病死蚕 (见图 1a), 而“桂蚕 F95”无明显病斑和死蚕, 发育正常 (见图 1b)。“桂蚕 F95”的结茧率为 94.83%、虫蛹率 90.63%, 万头产茧量 15.398kg, 万头茧层量 3.334kg, 分别比对照高 56.80%、60.83%、194.64%、206.43% (表 2 和表 3), 表现出较强的抗氟特性

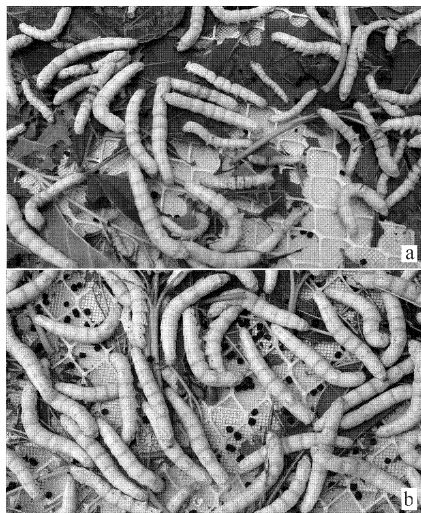


图 1 实验室添氟鉴定结果

Fig. 1 The results of laboratory fluonide inoculation identification

a. 两广二号(对照), b. 桂蚕 F95 a. Liangguang er hao (control), b. Guican F95.

2.3 农村试养鉴定结果

2.3.1 常规试养鉴定

2002年8月份及2003年5月和8月分3批在广

表 2 2002~2003年“桂蚕 F95”试验鉴定的丝质结果

Table 2 The silk quality results of “Guican F95” in 2002~2003

| 品种名 (杂交型式) Variety (cross form) | 出丝率 Raw silk percentage of cocoon (%) | 茧丝长 Cocoon filament length (m) | 解舒丝长 Non-broken cocoon filament length (m) | 解舒率 Reelability (%) | 纤度 Filament size (D) | 净度(分) Neatness (points) |
|--|---|--------------------------------------|--|---------------------------|----------------------------|-------------------------------|
| 桂蚕 F95 ^⑤ Guican F95 | 15.11 | 970.67 | 702.50 | 72.37 | 2.615 | 93.42 |
| 两广二号 ^① Liangguang er hao | 15.06 | 917.00 | 685.67 | 74.77 | 2.529 | 94.10 |
| 桂蚕 F95 ^⑤ Liangguang er hao | 16.73 | 1056.75 | 764.75 | 72.37 | 2.557 | 92.25 |
| 两广二号 ^② Liangguang er hao | 16.35 | 963.25 | 683.50 | 70.96 | 2.495 | 91.50 |
| 桂蚕 F95 ^⑤ Guican F95 | 16.97 | 1041.50 | 791.00 | 75.95 | 2.863 | 91.50 |
| 两广二号 ^③ Liangguang er hao | 16.80 | 1010.00 | 737.00 | 72.97 | 2.907 | 90.50 |
| 桂蚕 F95 ^⑤ Guican F95 | 14.29 | 941.00 | 670.00 | 71.20 | 2.575 | 90.75 |
| 两广二号 ^④ Liangguang er hao | 15.68 | 916.00 | 679.00 | 74.13 | 2.456 | 92.25 |
| 桂蚕 F95 ^⑤ Guican F95 | 15.72 | 974.17 | 709.83 | 72.87 | 2.355 | 92.20 |
| 两广二号 ^⑤ Liangguang er hao | 15.22 | 928.00 | 648.50 | 69.88 | 2.347 | 91.75 |
| 桂蚕 F95 ^⑤ Guican F95 | 15.36 | 987.00 | 671.00 | 67.98 | 2.306 | 94.50 |
| 两广二号 ^⑥ Liangguang er hao | 15.25 | 976.00 | 634.00 | 64.96 | 2.410 | 93.00 |

西的鹿寨县思贤乡、邕宁县良庆镇、贵港市桥圩乡、环江县思恩乡、横县、宜州市等6个县(市)的乡镇进农村试养。由各县蚕业站组织。2002年9月和2003年5月和9月分别收蚁鉴定。用正常桑叶共129张,平均张种单产36.046kg,单茧丝长974.17m,解舒率72.87%,净度92.20分,均略高于对照,详见表2和表4

2.3.2 氟污染蚕区试养鉴定

2001~2003年由广西上林县蚕种场组织在氟化物污染严重的上林县大丰镇三联村进行试养鉴定。该村边有较大的滑石粉工厂,上半年污染严重,桑叶氟含量达180~320mg/kg,由于氟含量严重超标(标准氟含量低于30mg/kg)导致饲养的当家品种“两广二号”发生大面积中毒死蚕,无法饲养,严重失产,甚至全部死蚕。但是,2003年5月25日收蚁时,饲养“桂蚕 F95”共112张,平均张种产茧35.417kg,比该蚕区无法饲养的当家品种“两广二号”增产40.87%,单张产值增356.22元(表4)。另外,氟污染蚕区试养的“桂蚕 F95”单茧丝长、解舒率和净度等(表2)均略高于“两广二号”。深受蚕农欢迎。

①②③为常规饲养,收蚁时间和鉴定单位分别与表1对应编号相同 ④添氟饲养,2003年广东蚕种研究所鉴定 ⑤农村常规桑叶饲养,在饲养地鉴定 ⑥氟污染区饲养,在饲养地鉴定

①②③ The silkworm was feeded with conventional mulberry leaf, the time of collecting newly-hatched larvae and the institution were as the number in table one. ④ The silkworm was feeded with mulberry leaf which was soaked with fluonide solution, the identification was made by Guangdong Silk worm Eggs Research Institute in 2003. ⑤ The silkworm was feeded with conventional mulberry leaf in the countryside, and the identification was making in there. ⑥ The silkworm was rearing in the area where mulberry leaf are severely polluted by fluonide, and the identification was making in there.

2.4 一代杂交种试繁

2002年及 2003年分别在广西蚕业技术推广总站及上林县蚕种场试验繁殖“桂蚕 F95”一代杂交种。

“桂蚕 F95”的克蚁产茧量 3.48kg,克蚁制种 12张,公斤茧制种 3.45张,分别比对照“两广二号”提高 10.1%、14.61%、5.50%,详见表 5

表 3 2002~ 2003年“桂蚕 F95”实验室添氟鉴定结果

Table 3 The results of laboratory fluoride inoculation identification of “Guican F95” in 2002~ 2003

| 品种名 (杂交型式) Variety (cross form) | 全龄 经过 Duration of larval stage (d ¹ h) | 4龄起蚕生命率 Viability of the fourth instar larvae | | 茧 质 Cocoon quality | | | 万头收茧量 Cocoon clop per 10000 silk worms | | 万头茧层量 Cocoon shell weight per 10000 silk worms | | |
|---|--|---|--------------------------------|--------------------------------|---|---------------------------------------|--|-----------------------|--|-----------------------|--------|
| | | 结茧率 Cocooning rate (%) | 虫蛹率 Survival rate (%) | 全茧量 Cocoon weight (g) | 茧层量 Cocoon shell weight (g) | 茧层率 Cocoon shell rate (%) | 实数 Real number (kg) | 指数 Exponent (%) | 实数 Real number (kg) | 指数 Exponent (%) | |
| 桂蚕 F95 ^① Guican F95 | 正交 Positive cross | 21 00 | 92.95 | 89.04 | 1.680 | 0.375 | 22.321 | 15.303 | 158.30 | 3.416 | 149.69 |
| | 反交 Reciprocal cross | 21 00 | 94.55 | 91.00 | 1.650 | 0.381 | 23.091 | 15.289 | 178.46 | 3.530 | 175.53 |
| | 平均 Average | 21 00 | 93.75 | 90.02 | 1.665 | 0.378 | 22.703 | 15.453 | 169.50 | 3.473 | 161.76 |
| 两广二号 ^① Liangguang er hao | 正交 Positive cross | 22 06 | 61.27 | 59.82 | 1.610 | 0.380 | 23.602 | 9.667 | 100.00 | 2.282 | 100.00 |
| | 反交 Reciprocal cross | 22 06 | 59.47 | 57.72 | 1.470 | 0.345 | 23.469 | 8.567 | 100.00 | 2.011 | 100.00 |
| | 平均 Average | 22 06 | 60.37 | 58.76 | 1.540 | 0.363 | 23.571 | 9.117 | 100.00 | 2.147 | 100.00 |
| 桂蚕 F95 ^② Guican F95 | 正交 Positive cross | 20 06 | 93.40 | 89.17 | 1.635 | 0.354 | 21.651 | 15.145 | 344.20 | 3.275 | 356.37 |
| | 反交 Reciprocal cross | 20 06 | 96.27 | 92.11 | 1.634 | 0.354 | 21.665 | 15.650 | 258.63 | 3.393 | 269.93 |
| | 平均 Average | 20 06 | 94.83 | 90.63 | 1.635 | 0.354 | 21.651 | 15.398 | 294.64 | 3.334 | 306.43 |
| 两广二号 ^② Liangguang er hao | 正交 Positive cross | 21 06 | 31.19 | 23.03 | 1.427 | 0.298 | 20.883 | 4.400 | 100.00 | 0.919 | 100.00 |
| | 反交 Reciprocal cross | 21 06 | 43.97 | 37.28 | 1.387 | 0.288 | 20.764 | 6.051 | 100.00 | 1.257 | 100.00 |
| | 平均 Average | 21 06 | 37.58 | 29.80 | 1.407 | 0.294 | 20.896 | 5.226 | 100.00 | 1.088 | 100.00 |
| 桂蚕 F95 ^③ Guican F95 | 正交 Positive cross | 22 08 | 97.48 | 94.36 | 1.627 | 0.367 | 22.557 | 15.823 | 117.57 | 3.569 | 113.41 |
| | 反交 Reciprocal cross | 22 08 | 95.95 | 92.97 | 1.564 | 0.352 | 22.506 | 15.012 | 109.67 | 3.380 | 105.43 |
| | 平均 Average | 22 08 | 96.72 | 93.66 | 1.596 | 0.360 | 22.556 | 15.418 | 113.59 | 3.475 | 109.38 |
| 两广二号 ^③ Liangguang er hao | 正交 Positive cross | 22 17 | 91.39 | 82.84 | 1.472 | 0.345 | 23.438 | 13.458 | 100.00 | 3.147 | 100.00 |
| | 反交 Reciprocal cross | 22 17 | 90.48 | 85.13 | 1.518 | 0.356 | 23.452 | 13.688 | 100.00 | 3.206 | 100.00 |
| | 平均 Average | 22 17 | 90.93 | 83.98 | 1.495 | 0.350 | 23.411 | 13.573 | 100.00 | 3.177 | 100.00 |

① 2003.08.10收蚁,广东蚕种所鉴定,从 4龄第 2口叶开始用氟化钠 300mg/kg溶液浸桑叶添食,每天添 2回,至 5龄第 3天止。② 2002.05.05 2002.08.19及 2003.05.25 2003.08.12收蚁,本站鉴定,从 4龄第 2口叶开始用 300mg/kg氟化钠浸桑叶添食,每天添 3回,至 5龄第 4天止。③ 2002.08.20,2003.04.12 2003.09.12收蚁,广西大学农学院鉴定,从 4龄开始用 300mg/kg的氟化钠浸桑叶添食,每天添 2回,5龄第 3天止。

① The collecting of newly-hatched larvae for identification in Guangdong Silk worm Eggs Research Institute was on August 10, 2003, the silkworm was feeded with the mulberry leaf which was soaked with 300mg/kg of NaF solution between the second mouth of fourth instar larva and the third day of fifth instar larva, and feed two times each day.② The collecting of newly-hatched larvae for identification in our station was on May 5 and August 19, 2002 and May 25 and August 12, 2003, the silkworm was feeded with the mulberry leaf which was soaked with 300mg/kg of NaF solution between the second mouth of fourth instar larva and the fourth day of fifth instar larva, and feed three times each day.③ The collecting of newly-hatched larvae for identification in the Agricultural College, Guangxi University was in August 20, 2002 and April 12 and September 9, 2003, the silkworm was feeded with the mulberry leaf which was soaked with 300mg/kg of NaF solution between the second mouth of fourth instar larva and the third day of fifth instar larva, and feed two times each day.

表 4 2001~ 2003年“桂蚕 F95”农村试养鉴定结果

Table 4 The results of productive test of “Guican F95” in the countryside of inside area in 2001~ 2003

| 品种名 (杂交型式) Variety (cross form) | 收蚁量 Amount of newly- hatched larvae collected (张, sheet) | 全龄经过 Duration of larval stage (d ² h) | 死笼率 Survival rate of larvae(%) | 全茧量 Cocoon weight (g) | 茧层量 Cocoon shell weight(g) | 茧层率 Cocoon shell rate (%) | 单张 产茧量 Cocoon crop per case of eggs(kg) | 单张产值 Output value per case of eggs (元, yuan) | |
|--|--|--|---|--------------------------------|-------------------------------------|------------------------------------|--|---|--------|
| 桂蚕 F95 ^① Guican F95 | 正交 Positive cross | 63.5 | 22 13 | 2.98 | 1.653 | 0.358 | 21.658 | 36.276 | 442.20 |
| | 反交 Reciprocal cross | 65.6 | 22 13 | 2.95 | 1.641 | 0.357 | 21.755 | 35.815 | 436.58 |
| | 平均 Average | 129.1 | 22 13 | 2.97 | 1.647 | 0.358 | 21.736 | 36.046 | 439.40 |
| 两广二号 ^① Liangguang er hao (CK) | 正交 Positive cross | 20.5 | 22 13 | 3.09 | 1.622 | 0.349 | 21.517 | 35.680 | 435.30 |
| | 反交 Reciprocal cross | 23.0 | 22 13 | 3.18 | 1.617 | 0.348 | 21.521 | 35.139 | 427.99 |
| | 平均 Average | 43.5 | 22 13 | 3.14 | 1.620 | 0.349 | 21.543 | 35.410 | 431.65 |
| 桂蚕 F95 ^② Guican F95 | 正交 Positive cross | 79.5 | 20 22 | 4.36 | 1.634 | 0.337 | 20.624 | 35.384 | 412.93 |
| | 反交 Reciprocal cross | 32.5 | 20 22 | 3.64 | 1.624 | 0.336 | 20.690 | 35.449 | 413.69 |
| | 平均 Average | 112.0 | 20 22 | 4.00 | 1.629 | 0.337 | 20.688 | 35.417 | 413.32 |
| 两广二号 ^② Liangguang er hao | 正交 Positive cross | 9.3 | 22 14 | 18.98 | 1.216 | 0.227 | 18.663 | 7.211 | 58.77 |
| | 反交 Reciprocal cross | 8.0 | 22 14 | 25.53 | 1.175 | 0.218 | 18.524 | 6.818 | 55.36 |
| | 平均 Average | 17.3 | 22 14 | 22.26 | 1.196 | 0.223 | 18.645 | 7.015 | 57.10 |

① 常规桑叶饲养, 2002.08.25~ 09.14; 2003.04.26~ 05.10, 2003.08.25~ 09.17收蚁, 在饲养地鉴定。② 氟污染区饲养, 在饲养地鉴定
 ① The collecting of newly-hatched larvae was in August 25 to September 14, 2002, April 26 to May 10, 2003, and August 25 to September 17, 2003, then were feeding with conventional mulberry leaf. The silkworm was feeded with conventional mulberry leaf and the identification was making in there.
 ② The silkworm was rearing in the area where mulberry leaf are severely polluted by fluoride, and the identification was making in there.

表 5 “桂蚕 F95”繁育试验普种生产结果

Table 5 The industrial silkworm eggs productive results of the multiplication test of “Guican F95”

| 品种 Variety | 收蚁量 Amount of newly- hatched larvae collected (g) | 全龄 经过 Duration of larval stage (d ² h) | 虫蛹率 Survival rate (%) | 全茧量 Cocoon weight (g) | 茧层量 Cocoon shell weight (g) | 茧层率 Cocoon shell rate (%) | 总收 茧量 Total output of cocoons (kg) | 总制 种量 Total amount of eggs produced (张, sheet) | 克 蚁 产 茧 量 Cocoon crop per gram of newly- hatched larvae | | 公斤制种量 Amount of eggs produced per kilogram | |
|--|--|---|--------------------------------|--------------------------------|---|---------------------------------------|--|---|--|-----------------------|---|-----------------------|
| | | | | | | | | | 实数 Real number (kg) | 指数 Exponent (%) | 实数 Real number (张, sheet) | 指数 Exponent (%) |
| 桂蚕 F95 ^① Guican F95 | 200 | 20 04 | 96.20 | 1.365 | 0.293 | 21.47 | 657 | 2300 | 3.29 | 106.8 | 3.50 | 101.4 |
| 两广二号 ^① Liangguang er hao | 490 | 20 04 | 94.30 | 1.323 | 0.285 | 21.54 | 1507 | 5200 | 3.08 | 100.0 | 3.45 | 100.0 |
| 桂蚕 F95 ^② Guican F95 | 316 | 20 08 | 94.50 | 1.530 | 0.330 | 21.57 | 1160 | 3972 | 3.67 | 113.1 | 3.42 | 106.5 |
| 两广二号 ^② Liangguang er hao | 1470 | 20 08 | 96.60 | 1.492 | 0.317 | 21.25 | 4772 | 15320 | 3.25 | 100.0 | 3.21 | 100.0 |
| 桂蚕 F95 Guican F95 | 516 | 20 06 | 95.35 | 1.448 | 0.312 | 21.55 | 1817 | 6272 | 3.48 | 110.1 | 3.45 | 105.5 |
| 两广二号 Liangguang er hao | 1960 | 20 06 | 95.45 | 1.408 | 0.301 | 21.38 | 6279 | 20520 | 3.16 | 100.0 | 3.27 | 100.0 |

① 上林县蚕种场, 2002.8.20收蚁。② 本站, 2003.9.10收蚁
 ① The collecting of newly-hatched larvae was in shanglin silkworm eggs-producing farm on August 20, 2002.② The collecting of newly-hatched larvae was in our station on September 10, 2003.

3 结论

利用桑蚕品种的耐氟性能力与其抗逆性的高度正相关原理^[4],以强抗逆性的品种直接添食一定浓度的氟化钠,选留有耐氟性基因的个体留种继代,可以选育出耐氟性强的品种。

抗氟品种“桂蚕 F95”在常规桑叶喂饲的情况下,主要经济性状与对照种“两广二号”相仿或略有提高。

抗氟品种“桂蚕 F95”用氟含量 150~280mg/kg 的桑叶进行全龄喂饲,结茧率为 94.83%、虫蛹率 90.63%,万头产茧量 15.398kg,万头茧层量 3.334kg,分别比对照品种“两广二号”高 56.80%、60.83%、194.64%、208.20%。在氟化物污染严重蚕区(桑叶氟含量多 200mg/kg 左右)进行农村试养,张种单产 35.417kg,比对照增产 404.87%。“桂蚕 F95”表现出较强的抗氟性,是一对夏秋用耐氟四元杂交新品种。

该品种选育、鉴定重点为抗高温多湿、抗氟性,但对 NPV 等抗病性方面没有作特别鉴定;同时,解舒

率、净度方面提高不大,因此有待于进一步作这方面的选育和研究。

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利用纳米蠕虫摧毁人体肿瘤细胞

美国科学家研制出一种纳米等级大小的“纳米蠕虫”,它可以在不破坏人体正常免疫防御系统前提下在血流中巡游,就像一个微型抗癌导弹,能够破坏“肿瘤细胞基地”。使用纳米蠕虫,医师将最终能够定位和移除常规医学方法中难以探测的小型肿瘤细胞,通过载荷可以消除肿瘤的特殊药物。这种超微纳米工具有朝一日可以有效地向肿瘤递送高浓度对人体有毒的抗癌药物,同时对人体其他器官不会产生负面影响。

科学家们认为这种球形氧化铁纳米蠕虫连接在一起,就像一条蚯蚓的片断,可形成 30 纳米长(正常蚯蚓长度的 300 万分之一)粘性蠕虫状结构。纳米蠕虫的氧化铁成份可在诊断设备中发亮,尤其便于核磁共振成像(MRI)装置通过发现纳米蠕虫来寻找人体内的肿瘤细胞。每个纳米蠕虫具有 8 个氧化铁磁性片断,这些磁性片断结合在一起将提供一个更大的观测信号。这样能够更好地观测更微小的肿瘤细胞,有望使医师能够诊断出处于早期发展阶段的癌症病情。

纳米蠕虫的聚合体外层是由右旋糖苷生物高聚物制成,科学家们使用治疗癌细胞的 F3 缩氨酸分子涂在蠕虫外表,缩氨酸分子可使纳米蠕虫摧毁癌细胞宿体。由于伸长外型,纳米蠕虫可以携带许多 F3 缩氨酸分子同时作用于癌细胞表面,在血液中停留数小时,纳米蠕虫科学家在他们的实验中对患有肿瘤的老鼠血液中注射纳米蠕虫,结果发现能够高概率地摧毁打击肿瘤细胞。

(据科学网)