

## HORTICULTURAL CROPS

Vegetable breeding work on pea, Chinese cabbages, cabbages and other vegetables are emphasized. The pea varieties Taichung 9, Taichung (sel) 1 (for pea use), Canner King, Perfection (for green pea use), Black Eye and Melting Sugar (for sprout use) are now extensively cultured by the farmers. The recently developed pea variety Taichung 11, characterized by its bright green color, sweetness and tender eating quality, is currently the most popular variety in Taiwan.

The muskmelon variety Taichung 1 developed by this station has excellent eating quality and good skin appearance and is suitable for greenhouse culture.

The protected culture methods, including water culture, plastic-tent culture, etc., for various vegetables are now being studied to produce pesticide-free vegetables. It is expected that the protected way of vegetable production will be introduced to the growers in the very near future.

Fruit tree researches are directed to develop the techniques of regulating the flowering time so that the fruit trees can be harvested 2-3 times a year. Practical techniques, such as the application of growth regulator cyanamide and defoliation practices, have been developed on grape vine and three harvests a year is now possible for grape production in Taiwan. Another example is the top-grafting of temperate-zone pear on Hengshan pear to regulate the flowering time of the latter. Pears can also be harvested 2-3 times a year to meet the market demands. Other fruit trees under study with regard to the similar nature are tropical mango, peach, plum and other fruit trees with certain degree of success. Basic physiological studies related to the regulation of harvesting time, such as the status of flower-bud formation and development following plant hormone treatment, are being taken with the help of electron microscopic and biochemical analyses.

### A. Vegetable Crops

#### 1. New Pea Variety-Taichung No. 11

Taichung No. 11 is a new edible podded pea cultivar developed in Taichung District Agricultural Improvement Station by crossing Odome (female parent) to Melting Sugar (male parent). It was named and released in 1980.

The plants are about 160 cm in height, having large leaves with lemon-green color, pinkish-white flower, more vigorous and quite resistant to drought and hot weather as compared with Taichung No. 9. It first sets on the 17th node, about 57 days for first picking under winter catch crop condition, or 10 days earlier than Taichung No. 9. The yield of Taichung No. 11 was 58% higher than Taichung No. 9 in the local yield trials. Edible pods are 8.76 x 1.52 cm., bright green,

straight, thick-walled, blunt ended, borne singly, sweet, tender, excellent in quality, and adapted for fresh market and quick freezing.

## 2. Pea Breeding

This breeding program was subjected to develop new edible podded pea cultivars with resistance to powdery mildew and to select new cultivars of snap pea.

From the progenies of (Taichung No. 11 x Manoa Sugar) and (Snap Sugar x Knight), 8 podded pea lines and 3 lines of snap pea were selected respectively, and will be used as experimental materials in next crop season.

## 3. Breeding of Rust-Resistant Kidney Bean Varieties

The purpose of this breeding program is to develop new kidney bean varieties for being resistant to rust by the backcross method.

This breeding program was started in 1978 by using "Black-seeded Creas-back" as recurrent parent and "15R-55-BK" as donor parent. After backcrossing two or three times, the breeding material is handled by the pedigree method.

According to the result of preliminary test in 1984, 72-7-11 and 72-7-12 were considered as promising lines. They all possessed high degree of resistance to rust and other good characteristics.

## 4. Variety Trials in Cabbage

Regional tests of thirty-seven cabbage cultivars of domestic and foreign resources were performed. The results showed that Tzao-chiou cabbage, Know-you 691, Know-you 692, Shyr-Jiau 8312 and Shiah-chiou cabbage are early and can be harvested in 55-60 days from transplanting. Occuring incidence of black rot disease was found to be lesser in YR50, Shyr-Jiau 8212, Shyr-Jiau 8213, and YR Jiin-chiou cultivars.

## 5. Regional Trial of Baby Carrot

The growing period of baby carrot is about 70-80 days. It is suitable as a inter-relaying crop between the first and the second crop. Result of spacing trial showed

that the spacing of 10x5 (cm) had the best yield of 3,975 kg/10a.

## 6. Purification of Chinese Leek

After 2 years observation, 18 promising lines were selected from 300 collected lines of Chinese leek Cv. "Nan-Hua". The average plant height of the 18 lines was 36.4 cm and the number of branches per plant was 4.5.

## 7. Purification of Water Chestnut

This experiment was conducted to purify and evaluate the 8 collected varieties of water chestnut.

Among the 8 varieties, Homei B had the largest tuber size. The average size was 3.27x2.05 (cm). The next were Thailand and Fuchou varieties.

The average tuber weight of 8 varieties was 11.2g, among them Homei B had the largest tuber weight (13g), the next were Fuchou (12.4g) and Tailand (12.1g).

## 8. Improvement on the Cultivation Technique of Water Shoot (*Zizania latifolia* Turcz.)

The wide-narrow row triangular planting increase the plant number about 33.3% per 10 a, but the diameter and weight of water shoot young stem are decreased, so the yield just increased about 15% per 10a only. The cultural method is inconvenient in field management, therefore it is necessary to be improved.

C.C.C. treatment retarded the elongation of leaf sheath. The plant treated with C.C.C. reduced about 11.6% in length as compared with that of non-treated. The difference of tiller number and yield between C.C.C. treatment and control are not significant.

## 9. Cultural Practice of Honewort

Honewort is a new kind of vegetables in Taiwan, the way of its cooking and taste were similar to celery. The growing period is about 90 days.

The result of fertilizer experiment showed that the rate of N-P<sub>2</sub>O<sub>5</sub>-K<sub>2</sub>O at 225-50-50 kg/ha had higher yield (green plant) of 2,958 kg/10a among the 5 treatments.

Among the 4 treatments of Gibberellin spraying, the concentration of 50ppm had the best effects on stem elongation and yield performance (3,540kg/10a) from the economic viewpoint.

Seed production test showed that the best time for seed harvesting was 90 days after flowering, which had the higher seed yield (148g/10m<sup>2</sup>) and the best germination rate (80%) among the 4 treatments.

### 10. Effect of Herbicides on the Weed and Radish Growth

Seven herbicides, A-820, diphenamide, oxyfluorfen, alachlor, linuron, propazine and pendimethalin were applied in radish field to test the efficiency of controlling annual weeds. The results indicated that radish was seriously injured by linuron and propazine. A-820, diphenamide, pendimethalin caused no crop injury and radish yield was similar or even better than the hand weeding plot. Alachlor at the rate of 1.72kg ai/ha showed slight injury to radish. Oxyfluorfen applied preemergence at 0.24 or 0.35 kg ai/ha were effective against annual weed, but showed 19% and 35% injury rates respectively. Among the seven herbicides, oxyfluorfen, linuron and propazine controlled most annual weeds effectively. The uncontrolled weed growth caused the highest reduction in radish yield (80%). Stomp and A-820 were the most suitable herbicides for the annual weed control in radish field.

### 11. Growth Characters of Carrot (*Daucus carota*)

Six characters in three types of carrot varieties are investigated for studying their growth behavior. Results are summarized as follows:

(1) Growth curve of leaf number, leaf length and root length were stable. The leaf weight and root weight were increasing rapidly from the 8th weeks, and the root size was increasing rapidly from the 6th weeks after sowing.

(2) The small type variety of carrot showed high growth efficiency of root at 10th to 12th weeks, and the middle and large type varieties of carrot showed at 12th to 14th weeks after sowing.

### 12. Genetic Behavior and Breeding of Sweet Pepper

Fifteen characters were investigated to study their genetic behavior in the parents, F<sub>1</sub> and F<sub>2</sub> generation of a diallel cross (not include the reciprocal cross)

involving four *Capsicum annuum* varieties.

Data were used to estimate the phenotypic and genotypic correlations among various characters and path coefficient among the yield and yield components. Results are summarized as follows:

(1) In general, genotypic correlation was found to be higher than phenotypic. Yield was significantly correlated with the number of fruit, fruit width and flesh weight, and was correlated negatively with days to first flower and fruit maturity.

(2) Path analysis showed that yield was mainly depending on the number and weight of the fruits. The fruit number had an appreciable direct and indirect effect on yield and influenced the yield through fruit weight and fruit length.

### 13. Adaptation and Variety Improvement of Fresh Soybean Production in Taiwan

8 varieties of fresh soybean from AVRDC were taken as materials for this regional test, where the variety Tzuzunoku was the check. The results indicated that high photoperiodism sensitive and medium photoperiodism sensitive varieties were not suitable for the spring crop. The high productivities of autumn crop may be resulted from the high temperature and short day in the autumn that dwarfed the plants and increased the branch numbers. So far as the cultivation and market demand are concerned the variety Tzuzunoku still stands the best.

### 14. Use of Non-woven Material in Yellow Leek and Cauliflower Production

In this experiment, we evaluated the effects of non-woven material on the quality of yellow leek and cauliflower. The results indicated that covered with native non-woven material could not improve the quality of yellow leek due largely to the high light transparency and water-retaining ability. High rotting percentage (90%) and more greenish of yellow leek were obtained from the plots covered with native non-woven material than that of imported material.

In cauliflower, the color of curds turned slightly yellowish when covered with native non-woven material, and lodging of plants as well as the rotted curds were found frequently due to the high water-retaining of this material as well as the over-burdening of the plants.

### 15. Improvement of Common Bean Varieties for Rust Resistance

#### (I) Development of rust resistant common bean lines

The objective of this study is to develop new rust-resistant bean varieties for stabilizing the bean production in Taiwan.

This work was initiated in 1977 to make a screening for the rust-resistant parental lines. Original cross between Black Creashack (recurrent parent) and 15R-55-BK (donor parent) was made in the fall of 1978. After two or three backcrosses, the progenies were subjected to selection and line yield trials. Preliminary result showed that 72-T-11 and 72-T-12 had high level of rust resistance. The former also showed high yield and low first-podded node and the latter gave long pods of good appearance.

## 16. Improvement of Common Bean Varieties for Rust Resistance

### (II) A comparison test for the newly bred rust resistant lines

A comparison test was conducted in two different crop seasons for the newly bred lines of common bean, Taichung 1, 2, 11, 12, and 15 obtained from a back-cross breeding. The check variety was the recurrent parent cv. Black Creasback. The results are summarized as follows:

1. All the tested lines performed the same or better than the check variety in terms of days to first harvest, last harvest, pod shape, and pod color. Line Taichung 11, yielded the highest in both crop seasons, being 26.7% and 32.6% higher than that of the check. Line Taichung 12 yielded slightly higher than its recurrent parent, also with its long, round and straight pods, showing a good marketing potential.
2. All the tested lines had less rust infection than the control variety in both crop seasons. In the spring crop, the infection rate of Taichung 11 and Taichung 12 was 1% that is much lower than the 19.5% of the check. The corresponding values for the fall crop were 10.3%, 5% and 87.8% respectively indicating the good rust resistance of the two lines Taichung 11 and Taichung 12.

## 17. The Effects of Covering Facilities on the Production of Vegetables

This study was conducted to compare the effects of covering facilities on the production of vegetables. The growth of the edible herbs and radish root was promoted and the yield were increased under covering facilities. But the heading of the head vegetables, such as cabbage and Chinese cabbage; and the flowering of edible flowers, such as broccoli, were delayed, and their yields were also reduced,

whereas the growth of lettuce was not affected.

The covering facilities provided a special effect in eliminating rain injury, but there is no absolute effect on the control of insects and diseases. Disease, such as soft rot, is easily found under facility environment, whereas those easily induced by rainfall were well-controlled. Isolation with nylon net can not prevent the injury of diamond-back moth and turnip flea beetle.

## B. Fruit Crops

### 1. Effect of Calcium Cyanamide and Merit on the Rest Breaking of 'Kyoho' Grapevine

Experiment was carried out by applying a leaching solution of calcium cyanamide or the Merit No. 1 solution on the resting buds in autumn and winter respectively. The effect of the treatment of calcium cyanamide on the rest breaking was unstable. But it increased the percentage of budbreak, promoted more budbreak of basal buds and reduced the tendency of apical dominance considerably, when the resting buds were treated either with the mixed solution of calcium cyanamide and Merit or separately. It is concluded that the mixed solution of 20% calcium cyanamide and 50% Merit was much more effective than the ethylene chlorohydrin.

### 2. Effect of Cycocel on the Enhancement of Fruit Setting in Grape

The inhibition of the shoot growth before blooming was an effective treatment in enhancing fruit setting, and various concentrations of Cycocel do this well. The higher the concentration of Cycocel was used the more the grape berries were settled, whereas the cost of labor in the berry thinning was increased. Therefore, a higher concentration is not recommended.

### 3. Application of Alzodef on the Termination of Dormancy in Grapevine Bud

#### (1) In Vitro Cutting Test

1% Alzodef application was effective and comparable to ethylene chlorohydrin application in inducing budbreak of Kyoho grapevine cuttings. 2.5% Alzodef or DNOC application also induced budbreak to some degree but not as effective.

**(II) Field Test**

Application of Alzodef was effective and comparable to that of ethylene chlorohydrin in inducing budbreak of field Kyoho and Golden Muscat grapevines. During January 1983, budbreak started 21 days after 2.5% Alzodef spray. The optimum rates of Alzodef applied before and after mid-February were 4% and 2.5%, respectively.

**4. Re-utilization of Shoots of Shinseiki Pear Grafted on Hengshan Pear**

(I) Topping, bending the shoot and spraying with Alar effectively inhibited the growth of the shoot and induced the development of flower buds of Shinseiki pear that grafted on Hengshan pear.

(II) Smearing with 166666.6ppm ethylene chlorohydrin on the differentiated flower bud, cut surface, scar branch or terminal bud during August to November induced budbreak and fruiting of flower bud.

(III) A fruit thinning method to get better yield and quality is to retain 1-4 fruits per fluorescence and a total of 4 fruits per shoot.

**5. Flower Bud Differentiation and Forcing of Budbreak of Pear**

Two years of observation of the tissue sections indicated that the flower bud differentiation of Shinseiki pear started from early July and completed in mid-August. As for Hengshan pear, initiation started from early June and completed in August. Many chemicals were applied to induce bud burst of the shoots, the result indicated that calcium cyanamide, cyanamide and thiourea were effective. A more intensive study on the screening of the chemical is still carrying on.

**6. Non-woven Material Bagging in Top-grafted Pear Production**

Three kinds of bag made of non-woven material as well as the paper bag commonly used in pear production were taken as bagging material in this experiment. As the non-woven bags retained water after the rain, worse epidermal color and more rotted fruits were obtained during harvest period than that of paper bags bagging. Higher percentage of physiological spots on Shinseiki pear also occurred when non-woven bags were used. For the application of this new material in pear bagging, further study in improving the quality of non-woven material should be taken into consideration.

**7. Inhibition of Lateral Buds of Loquat**

MH-30 sprayed on the loquat plant effectively inhibited the growth of lateral buds, whereas the practical concentration is to be reconfirmed. MH-30 is a mobile chemical which may cause fruit drop, therefore the spray during blooming and setting should be avoided.

**8. Non-woven Material Bagging in Loquat Production**

In this experiment, we compared the effects of non-woven material bagging and paper bag bagging in loquat production. The result showed that two kinds of paper bags used were better than the non-woven material in the improvement of fruit skin color and the increasing of sugar content. There was no difference in number of fruit and single fruit weight between bagging materials.

**9. Forcing Culture of Mango**

This study was to find a method to promote flower initiation and bud burst of mango. The results indicated that ethrel can effectively inhibit the new shoot growth, therefore enhanced the flower initiation. Subsequent application of either calcium cyanamide or acetylene water could promoted the bud burst. But it still remains a problem to be dissolved, i.e., a parthenocarp or abnormal small fruit always gained due to the low temperature in the winter.

**10. Forcing Culture of Peach and Plum**

In Taiwan, peach and plum are usually harvested from April to May yearly. This study was dealing with a forcing culture method to advance the harvest for 3 to 4 months earlier than the usual. In August, defoliation with C.C.C. or B-9 inhibited shoot growth and promoted flower bud initiation. Then, sprayed with cyanamide or ethrel to induce bud burst and blooming. The fruits were then harvested in February or March.

**11. Cultivation of Strawberry**

(1) A variety 'Harunoka' was selected for cultivation in Taiwan. It has a low chilling requirement, big fruit size, high sugar content, and desirable taste, with a yield of 20,000 to 28,000 kg per 10 a.

(2) A plastic film with outside silver white and inner black color was used as covering material. It increased the light intensity by reflecting the sunlight, kept the earth temperature, inhibited the growth of weeds, decreased diseases, and protected the fruits from rotting.

(3) In the herbicide screening, Lasso, Enide, and Dual were selected.