

Oblonga, that was recently shown to be resistant to verticillium wilt, was challenged with both strains in greenhouse evaluations. Although a resistant rootstock, (to which susceptible commercial olive varieties may be grafted) is available, measures also are needed that will prevent spread of the disease within established groves.

The disease problems associated with

the culture of cotton and olives in the San Joaquin Valley indicate that culture of other perennial and annual crops susceptible to verticillium should be more critically evaluated in the future.

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Importation of wild strain

JAPANESE QUAIL (wild coturnix)

offers new game bird possibility

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Domestic coturnix, or Japanese quail, have been used for research in several disciplines at the Avian Sciences Department, Davis, since 1957—including investigations in environmental physiology, nutrition, genetics, cancer, environmental toxicology, and embryology. The small, fast-maturing birds allow savings in research time and money. Studies reported here show differences in viability, hatchability, fertility, egg production and weight and age at sexual maturity between the recently imported wild species and the domesticated coturnix—leading to speculation that the bird might still be established as a game bird in this country, despite previous unsuccessful attempts with the domesticated strains.

DOMESTICATED COTURNIX or Japanese quail have been used as the pilot animal for research in several disciplines since 1957 in the Avian Sciences Department at Davis. The small birds weigh approximately one quarter of a pound, and cost much less to feed the numbers of birds required to produce statistically significant results. Their size also allows the use of very small growing chambers, taking up much less space than is needed for chickens or turkeys (particularly in

physiological research and photoperiodic studies). Experimental results with reproduction may be obtained more quickly with coturnix as they mature in five to six weeks after hatching—as compared with chickens which require five months to mature. In production, domesticated coturnix lay as many eggs per year as most chickens. Because the egg size is relatively much larger than chickens, the coturnix, (laying at 75% production rate) produces eggs equivalent to body weight every 19 days.

The quail *Coturnix coturnix* has a long life history depicted in both Egyptian hieroglyphics and references in the Old Testament. Since ancient times the quail have been kept under domestication in Japan. Their meat and eggs, both of economic value, were easily grown. When wild, the birds' diet consisted of seeds and insects injurious to agriculture.

In the United States a number of importations of coturnix (starting in about 1870) were made in unsuccessful at-

tempts to establish it as a game bird. In 1957 over 200,000 coturnix were reared and released by the Missouri Conservation Commission. After hundreds of thousands of birds had been imported by many states, it became established only in Hawaii on the islands of Maui, Kauai and Hawaii. The state has open season on coturnix with a bag limit of fifteen.

At the Toyohashi Quail Farming Co-operating Association in Japan, coturnix females have a productive life of one year and produce at an 80% rate during this time. The eggs are packed in cartons of 10 eggs for retail sale to be cooked and served in many ways. From May to November is a period of low egg prices, and some of the eggs produced during this period are saved for incubation. It normally takes 40 days to reach sexual maturity under artificial light at night. The Toyohashi Association reported a growing mortality of from 5 to 20%, hatchability of 60 to 70% and fertility of 75 to 90%. The Japanese sell both young fryers and adult birds for meat.

BODY WEIGHTS OF WILD AND DOMESTICATED STRAINS OF COTURNIX AT DIFFERENT AGES (MEAN AND STANDARD ERROR)

	Day old	1 week	8 weeks	Median age at sexual maturity	Non-layers at 9 weeks of age
	g	g	g	days	%
Females wild	6.4 ± .16	14.9 ± .42	104.2 ± 2.7	59	50
Females tame	6.2 ± .20	20.0 ± 1.73	139.2 ± 3.2	44	0
Males wild	5.6 ± .20	13.8 ± .50	92.6 ± 2.2		
Males tame	6.2 ± .11	12.6 ± 1.47	108.8 ± 4.0		



Female coturnix from wild (left) and domesticated (right) strains. Wire spacing in cages is 1 x 2 inches.



Male coturnix from wild (left) and domesticated (right) strains. Rough plumage of wild birds is from escape attempts.

Random breeding flock

A random breeding flock of coturnix has been kept at the University of California since 1967. These birds have shown considerable variation in their gonadal photoperiodic response. The large variability in response required that many more birds be used in experimental groups so that significant results could be obtained. For this reason it was desirable to obtain new and less domesticated stocks that would be more photo-responsive. Eggs were obtained from wild stock and their backcrosses through the courtesy of K. Sakai and T. Kawahara of the Japanese National Institute of Genetics, in Mishima, Japan. The eggs were flown to Hawaii in April 1970, where they were hatched, brooded, and reared at the University of Hawaii's Waialeale Research Farm on Oahu. The eggs of this generation were shipped to the Avian Sciences Department at UC Davis where they have been hatched and the young studied.

The data on the wild stock in a California environment differs somewhat from the results published by researchers at the National Institute of Genetics of Japan—when comparing the productive traits in wild and domesticated quail. Nearly 300 wild quail were captured near the foot of Mt. Fuji and successfully propagated. F₁ hybrids between wild and domesticated strains and backcrosses to the parental strains were bred for the experiment.

The wild strain was found to be consistently different than the domesticated line in most of the traits studied. The body weight of the wild line was lighter at all ages than the domestic line, and gene effects on the growth curve were additive.

Differences between the body size and the mature weights of the wild line bred in the laboratory were 97.6 g for females and 92.6 g for males, as compared with 93.4 g for wild bred females and 83.0 g for males. The shank length of captured birds was consistently longer than that of the laboratory strain.

Domesticated quail

Domesticated quail attained sexual maturity at an average of 48.3 days, whereas wild strains matured at 117.0 days. Twenty weeks after hatching all females in the domesticated strain were laying but 47% of the wild line females were not laying. Viability, hatchability, fertility, egg production rate and egg weight of the wild strain was poorer than that of the domestic strain. These results suggested that there are distinct differences in genetic constitutions between wild and domesticated quail. Such differences may be produced in the course of domestication though the mechanisms are not yet known.

Fifty wild coturnix from the National Institute of Genetics, Mishima, Japan were compared with 31 UCD line 908 coturnix in 1970 at Davis. All were brooded under the same conditions: same diet, temperature (23°C), and photoperiod (16L:8D). Observations recorded included: weekly body weight (individual), color and appearance of sexual dimorphism, sexual maturity and behavior traits. The results from these observations made over a period of about eight weeks showed that the body weight of both the male and female wild quail was less than that of the domesticated line. At 8 weeks of age this difference was

16 and 35 grams for the males and females, respectively. The table shows the body weights of the wild and tame coturnix for the first six weeks.

A few quail showed sexual dimorphism after only 11 days, however, the population as a whole required three weeks. There appeared to be no difference in the onset of sexual dimorphism between the two strains. Wild strain birds were slightly lighter in color than were birds of the domestic strain. Sexual maturity of both wild and domestic strains was obtained in the sixth and eighth weeks. The median age of females at sexual maturity differed by 2 weeks from wild and domestic strains (for those birds that laid eggs). However, among non-laying females, half of the wild population were not mature at nine weeks of age but all of the control females were. Results of behavioral observations showed a restlessness and tendency towards flight in the wild strain as compared with the much more docile domestic strain. The wild strain birds were also more vocal.

After seeing the wild strain of coturnix in feral conditions, and observing their wildness in the laboratory, there appears to be a possibility of establishing this strain as a game bird in California. It is possible that the strains previously released were domesticated strains. Presently, these birds are being kept in outdoor pens to see if they will nest and rear their young (previously tested laboratory quail did not).

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