Early spring irrigation softened the bolls and released the weevils from their cells. The stub cotton produced green foliage on which these weevils could feed before planted cotton was available, thus preventing suicidal emergence.

Four generations of weevils had developed in stub cotton by August 6, whereas only an occasional punctured square could be found in planted cotton at that time. As usual infestations in planted cotton did not develop until September. However, the extremely high populations that built up during the summer in stub cotton began to migrate heavily into planted cotton the latter part of September, which has caused populations to increase in these areas much more rapidly than in areas where no stub cotton was grown. Thus the late light infestations elsewhere resulted entirely from weevils emerging after the summer rains from thurberia or wild cotton.

(Mr. Bottger is Investigations Leader, Cotton Insect Branch, Entomology Research Division, ARS, USDA, cooperator with the University of Arizona. Some of the field observations supporting this work were made by George P. Wene and his assistants, University of Arizona Agricultural Experiment Station).

## Pesticide Residue Survey on Arizona Milk, Composite Summary, 1964

(J. M. Witt)

Studies for several seasons have shown (1) that pesticide residues on forage, mainly alfalfa, are an important source of pesticide contamination of Arizona milk and (2) that DDT and its metabolites have been the most serious pesticide contaminants found in this milk. Since DDT is not applied directly to alfalfa hay crops for insect control, the residues of DDT found on alfalfa hay in Arizona are mainly due to drift of pesticides from applications made to nearby crops, including cotton. Other possible sources of alfalfa contamination are now being investigated, although drift still appears to be the principal source. Recent studies on drift of insecticides are summarized in an adjacent section. The principal result of drift onto alfalfa hay, or any other contamination of hay, is the accumulation of pesticide in milk. The extent of this milk contamination is summarized below.

Graphs 1 and 2 show the results of the Pesticide Residue Study on Arizona milk conducted in 1964 by the Insect Toxicology Laboratory, Department of Entomology, University of Arizona in cooperation with the United Dairymen of Arizona and Federated Producers Association. The graphs also show a comparison of the results for 1964 with the three previous years.

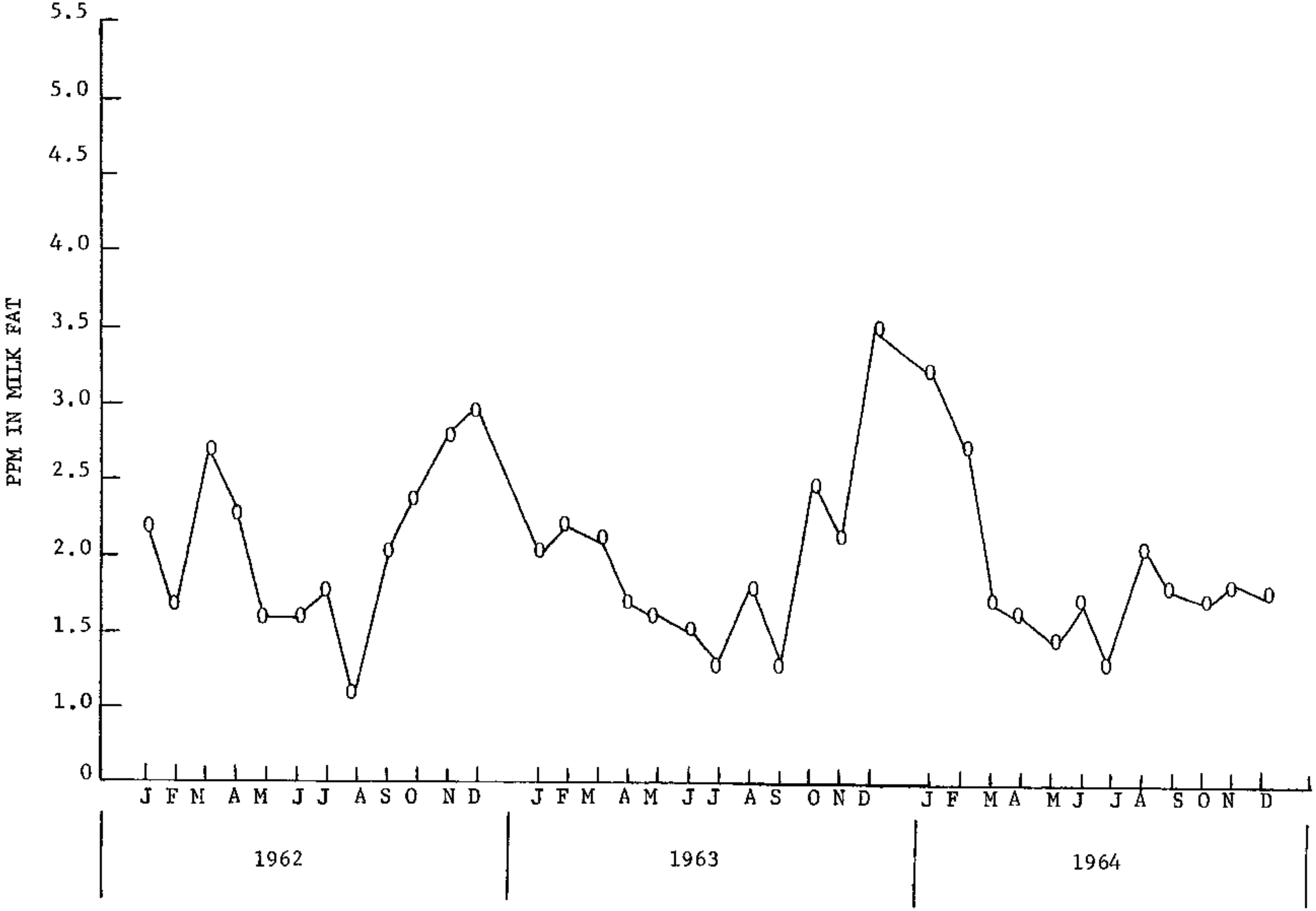
Milk was sampled by the tanker load from various geographic areas of Arizona by the two dairy cooperatives. Approximately 32 tanker loads of milk representing one to four dairy farms were sampled on most weeks. On some weeks, milk from individual farms was sampled, particularly if a tanker serving that farm had been found to be high. Tankers serving different regions were sampled from week to week.

It is interesting to note on the 1964 summary that the seasonal cycle of the amount of pesticide residues in milk has been broken, since the usual fall and winter peak did not occur. This is highly encouraging, although the overall

Graph No. 1

MONTHLY VARIATION

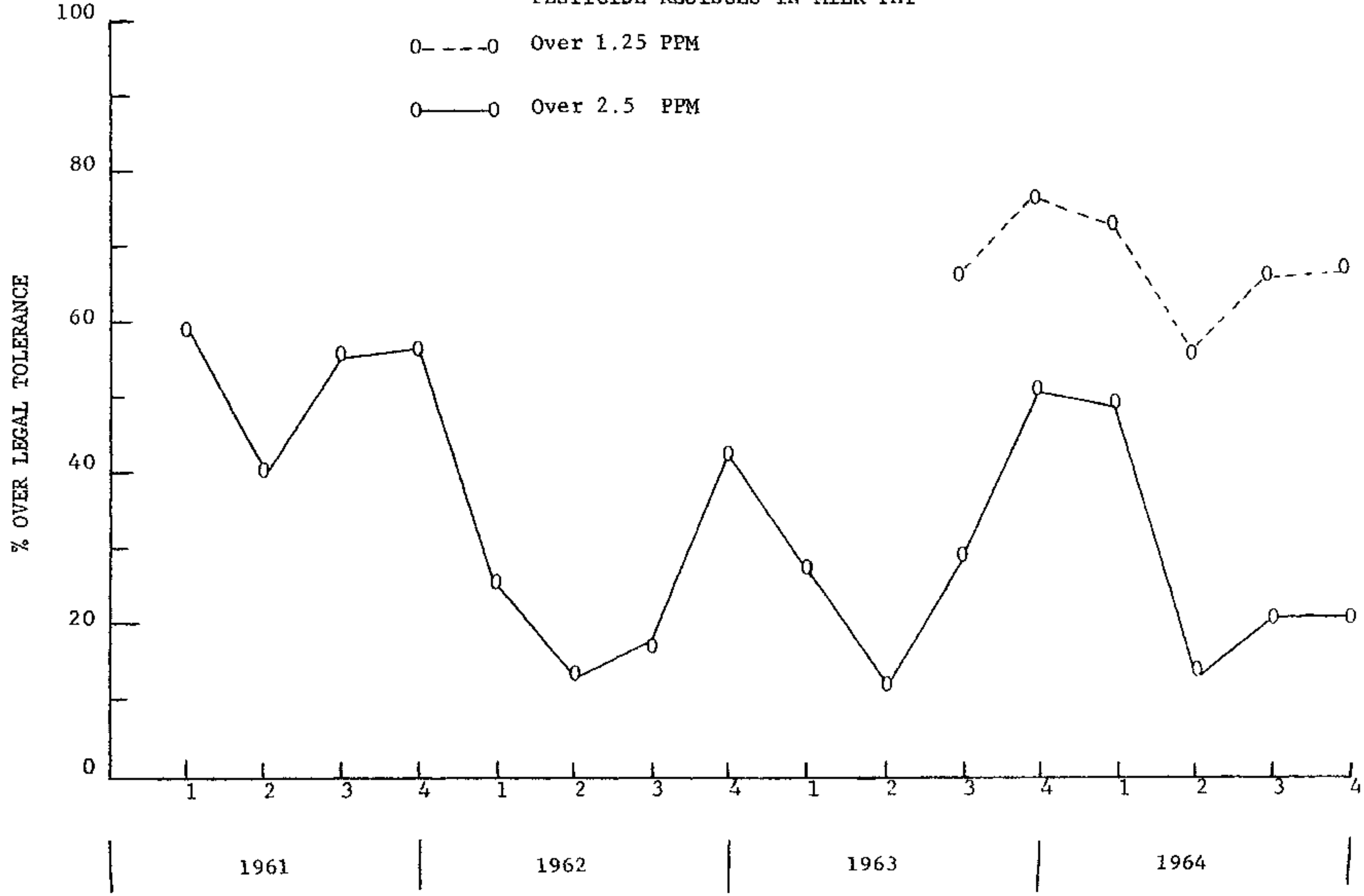
TOTAL PESTICIDE RESIDUES IN MILK FAT



Graph No. 2

SEASONAL VARIATION

PESTICIDE RESIDUES IN MILK FAT



values are still high enough to be of concern. This reduction in pesticide content is the most abrupt and of the greatest magnitude that has occurred since the survey program was begun.

It is not possible to give the exact reasons for the improved milk situation. At this time it will suffice to say that the total effort in Arizona is beginning to reduce the pesticide content and it is hoped this effort will result in a continued decline during the months ahead.

## Pesticide Drift Studies

(P. D. Gerhardt and J. M. Witt)

Downwind drift tests comparing sprays and dusts have consistently shown dusts to drift farther than sprays at about a 4 to 1 ratio.

Graph #3 shows an example of a drift curve from a typical experiment. The 0.5 parts per million level is pointed out because this for a time was considered to be the maximum level in the feed of dairy cows which would not result in a pesticide content in milk fat in excess of an "analytical zero" level of 2.5 parts per million. This "analytical zero" has now been reduced to 1.25 parts per million. It is therefore necessary to reduce the acceptable ("safe") pesticide residue level in feed (including alfalfa hay) from 0.5 to 0.25 parts per million in order to meet these new federal requirements.

### Downwind drift limits for pesticide sprays and dusts

Table #1 gives a summary of data from several experiments using different insecticides. The drift limits shown are the approximate distances downwind from the treated, or "target" crop beyond which deposits of drifted pesticides on alfalfa (later cut, baled, and fed to dairy cows,) are considered unlikely under the conditions assumed below to produce pesticide residues in milk in excess of specified "analytical zero" values. These figures are based on field records and laboratory analyses from pesticide drift experiments, conducted in central Arizona over a period of years. Drift limits are affected by differences in atmospheric conditions, localities, pesticides used, and other factors. It is necessary to approximately double the limits for 0.5 parts per million to reach the 0.25 p.p.m. level required to meet the current "analytical zero" in milk fat of 1.25 p.p.m.

The drift limits summarized in Table 1 are based on the following assumptions:

1. 2 to 5 miles per hour air velocity.
2. A temperature inversion (negative lapse rate) of 2 to 4 degrees, F., at a height of 24 feet (7.5 meters).
3. Pesticide residues in baled alfalfa hay, from drift for the distance shown, of 0.5 parts per million and of 0.25 p.p.m. These amounts may be expected to produce pesticide residues in milk fat below "analytical zero" values of 2.5 and 1.25 p.p.m., respectively. Actual residues on baled hay could be much lower or much higher, depending on the pesticide used.
4. A hay curing ratio (weight loss due to drying) of 4 to 1. (It could be as low as 2.5 to 1).