ISSN 1021-366X

Investigation of the Pathogenic Factors of Sauropus androgynus Poisoning

Abstract

The purpose for this study is to investigate the dosage effects of Sauropus androgynus on pulmonary functions and to better understand the epidemiology of the Sauropus androgynus poisoning. The subjects studied were 278 Sauropus androgynus users who had sought for telephone counseling in 1994-1995 through the Taipei National Toxicology Counseling Center, the Taipei Veterans General Hospital, the Taichung Veterans General Hospital, the National Chengkung University Hospital, and the Department of Health. Every subject was interviewed with a structured questionnaire. The questionnaire was designed to obtain the following: demographic information of the users, history of Sauropus androgynus consumption, health history, use of any weight-reducing drugs, clinical symptoms/signs (while using and after tennination of use), findings of pulmonary function tests and high resolution CT scan.

The results of this study indicated that the use of Sauropus androgynus induced primarily cardio-pulmonary problems such as: dyspnea, heart bum, coughing, and palpitation. Also, it was determined that the dosage of Sauropus androgynus was not associated with weight-reduction. Educational level and occupation did not affect the intake of Sauropus androgynus. In addition, this study found that the symptoms of poisoning can appear no matter whether the stem or the leaf is eaten; or the juice is frozen or filtered; or any additive is added; and the way it is processed. In conclusion, the results noted, by adjusting for gender and body mass index (BMI) of the cases, the dosage of the vegetable was found to be significantly associated only with FEV1 and FVC, but not with FEV1/FVC, RV, DL0, and FIRCT (all p values larger than 0.05).

Key Words: Sauropus androgynus poisoning, dosage effect, pulmonary functions, epidemiology

Introduction

Sauropus androgynus has been eaten by Malaysian and Indonesian for a long time.[1] Literature[1,2] show that the vegetable is nutritious and contains moderate energy, protein, fat, calcium, iron, carotin, and vitamin C. The vegetable was initially brought into Taiwan's restaurants as a first-rate vegetable. It was later promoted as a "health food for the purpose of weight reduction". It has then been used by many for the cure of obesity, hypertension, gout, and gynecological diseases.

The first case of Sai4ropus androgynus poisoning was reported on August 23, 1994. The patient, after having eaten the vegetable for 40 days, was treated for insomnia, loss of appetite, and dyspnea. An EKG finding showed Tordade de pontes.[3] Though the vegetable was not generally known, it was not possible at that time to confirm that the poisoning was due to the consumption of the vegetable. It was not until August of 1995 that outbreak of Saw-opus androgynus poisoning was reported. Most victims were young, obese women complaining of symptoms of dyspnea. However, no disease of the respiratory system was diagnosed.[4]

Even though no cases of poisoning were reported, the vegetable has been eaten in Malaysia for many years. However, many cases of poisoning have been reported in Taiwan. The likely reasons for this difference are[5]: the user's hidden illness, body metabolism status, and HLA types; the kind of vegetable, the parts, and the amount consumed; the way the vegetable is processed; and the ingredients of the vegetable such as papaverine.[6,7] In order to understand the etiology of the poisoning, the present study investigated the dosage effects of Sauropus androgynus on pulmonary functions. As a result of collecting information from poisoning victims, the study was able to understand the epidemiology of the poisoning.

Materials and Method

Study Subjects

278 users of Sauropus androgynus who had sought for telephone counseling in 1994-1995 through the Taipei National Toxicology Counseling Center, the Taipei Veterans General Hospital, the Taichung Veterans General Hospital, the National Chengkung University Hospital, and the Department of Health were interviewed.

Study Method

Each user was telephone-interviewed with a structured questionnaire. The questionnaire contained items such as: personal demographic information, history of Sauropus androgynus consumption, disease history, use of any weight-reducing drugs, clinical symptoms/signs (such as, symptoms appearing in the first stage after the use of the vegetable; serious symptoms in the second stage after the use of the vegetable; symptoms appearing in the third stage after terminating the use of the vegetable; and serious symptoms appearing in the fourth stage after terminating the u

se of the vegetable), hospital information of pulmonary function tests, findings of high resolution CT scan (HRCT). Sometimes, cases were approached in person for further information. Hospitals where cases had been treated were visited for information on pulmonary functions and HRCT findings to understand the effect of the vegetable on dyspnea.

Data Processing and Statistical Analysis

Information of questionnaire and findings of medical records were keyed-in with Fox-Pro and Epi-Info softwares. SAS was then used to describe the distribution of each variable. Wilcoxon rank sum test was used to test the sexual difference of each variable (such as: age, BMI, daily consumption of the vegetable, days of consumption, body weight reduced). Pearson X 2 test or Fisher exact test was conducted to compare difference in the distributions of variables. Then, rank regression analysis was employed to see if the vegetable could in fact reduce body weight.

Finally, logistic regression analysis was applied to study the relationship between the amount of the vegetable consumed and the effects of pulmonary function. This relationship was further explained with the use of pulmonary function indexes which clarified the following as outcome variables: forced expired volume in one second (FEy1), forced vital capacity (PVC), FEVI against PVC (FEV1/FVC), residual volume (RV), diffusing capacity for carbon monoxide (DLco), and HRCT. The variable used to explain the above indexes was the total amount of the vegetable consumed. Gender and BMI were used to adjust the relationship between outcome and explanatory variables.

Results

Background Information of Cases

Table 1 presents the background information of the 278 Sauropus androgynus users. Among them, 19 were males (6.8%), and 259 females (93.2%). They were not significantly different in age and education ($p > 0.05$, individually). The median BMI value of the males was 27.0 kglm2. This was significantly higher than the 24.6 kg/m^2 of the females ($p< 0.05$). More than a half of the females (57.14%) were housewives.

Some cases had history of pulmonary diseases: 15 cases (5.40%) had asthma (one male and 14 females); 5 (1.80%) had other pulmonary diseases (one male and four females). These findings were taken into consideration when analyzing the relations between Sauropus androgynus and pulmonary disorders.

Sources of the Sauropus androgynus and Its Consumption

Table 2 shows the sources of the Sauropus androgynus and its use. The Table 2 shows the sources of the Sauropus androgynus and its use. The

vegetable is grown primarily in Malaysia (40.65%), Taiwan (19.78%), India, Indonesia, Thailand (altogether 5.76%), and Unknown sources (33.8 1%). The vegetable was purchased at the market (32.25%), from the farmer's associations (5.80%), beauty parlors (2.89%), and Chinese medicine pharmacies (1.81%). The rest of the users (57.25%) had the vegetable supplied by friends, bought directly from dealers, given by someone, or were unwilling to disclose the sources. The sources of information about the vegetable were: friends (74.10%), through retailers (7.19%), media (5.76%), beauty parlors (2.89%), out of personal curiosity (1.44%), and others (8.63%). Two of them (0.72%) even said the vegetable was recommended by doctors. Men and women used the vegetable for weight-reduction (79.50%), to control hypertension (5.04%) and blood fat (0.36%), for cosmetic reasons (1.80%), and as a vegetable or for other reasons (13.31%).

Because the vegetable was expensive, in most cases (97.12%), the whole part was eaten; some took the stem (0.36%) or leaves (2.52%) only, coincidentally no one ate the root of it. However, with regard to frequency of methods of preparation, the vegetable was prepared 130 times solely as juice (36.83%); then 123 times as stir-fried (34.84%); 69 times as bought in the form of juice concentrate (19.55%); 28 times (7.93%) made as a soup; and 3 times made into concentrate. These findings concluded that the vegetable was generally consumed either as a juice or as a stir-fried vegetable.

Although the vegetable can be prepared for making juice, or stir-fried, the texture of the vegetable must be considered, therefore, only the young leaves can be consumed. For those who prepared or bought vegetable juice, 44.93% had the juice filtered, 55.07% of them did not. Nevertheless, 83.52% stored it in the refrigerator and drank it later. We further noted that the taste was not agreeable, so fruit or other additives were added to the juice to improve the flavor. The fruit that was added were: pine apples (26.60%), guavas (23.71%), apples (6.80%), and along with adding ginger (4.74%) and milk (0.41%).

The median amount consumed each day, male and female, was approximate 150 grams, and not exceeding 600 grams. We found, out of the 260 cases who still remembered the duration of which time they ate the vegetable, the median duration was 20 days with a range from 1 to 365 days. In comparison, men ate longer than women (30 days against 20 days). As a result, ten men felt they had lost 2 to 10 kg of body weight (the median being 5.5 kg); 165 women felt they had lost 1 to 15 kg (the median being 3.0 kg). However, when logistic regression analysis was done, the result did not show any association between the dosage of the vegetable and weight loss (Table 6, $p > 0.05$).

After the termination of use, in 37.0% of the males (7/19) and 41.0% of the females (105/259), the symptoms disappeared. The reasons for this termination mentioned by the news media (29.3%); and for men, unfavorable symptoms

(26.3%) and news media (31.6%) conclusively. Surprisingly, very few terminated the use after they were told that the vegetable could be hazardous (10.5% for men, 5.0% for women).

Symptoms by Stage

Table 3 explained the clinical symptoms that occurred in sequential order during use and after termination of use in a stage by stage process. The symptoms in the early stage of vegetable use (the first stage) appeared as follows: insomnia, excitement, loss of appetite, heart burn, dizziness, dyspnea, palpitation, coughing, and irregular heartbeat. In the second stage of vegetable use, they were: dyspnea, heart burn, coughing, dizziness, palpitation, insomnia, and irregular heartbeat. After the termination of the vegetable use (the third stage), the symptoms were: dyspnea, heart burn, coughing, speech problem, palpitation, sputum, dizziness, irregular heartbeat, and chest pain. Finally, during the fourth stage of the vegetable use, the symptoms were: dyspnea, coughing, heart burn, dizziness, chest pain and sputum. When comparing the four stages, there were some common symptoms that appeared throughout: dyspnea, heart burn, coughing, and palpitation. Therefore, we concurred during the consumption of Sauropus androgynus cardio-pulmonary symptoms were induced.

After carefully examination, we found it took various time periods to develop the symptom of dyspnea in each stage. For example, in the first stage, 31 users developed dyspnea within 1-90 days (median 4 days). However, in the second stage, 44 users developed serious dyspnea within 2-180 days (median 30 days) and even after the termination of use ranging from 3-270 days (median being 90 days), 65 users still had serious dyspnea.

Pulmonary Function Examination and HRCT

Among the 118 users who had completed the pulmonary function examination, 33.9% (40/118) had an FEV1 value lower than 80% of the expected value (Table 4); and 28.8% (34/118) had an FVC value lower than 80% of the expected value. The question concerning the bronchi of the poisoning victims were obstructive or restrictive could not possibly be answered by either of the values of FEV_1 or FVC. Therefore, a reference computation was made with regard to the ratio of FEV_1 against FVC. Approximately 22.1% (27/122) of the cases had a FEV_1/FVC value lower than 70% of the expected value. This suggested their bronchi could have had some obstructive disorders. Furthermore, 96.5% of the cases had an RV value larger than 20% of the expected TLC (total lung capacity) value. Therefore, this could mean that many (96.5%) of the cases had pulmonary obstructive disorders, leading to a more than 20% residual volume of air in the lungs. Another 55.5% (45/81) of the cases had a DLco value lower than 80% of the expected value, indicating that more than a half of the cases (55.5%) had problems diffusing gas across the

alveolar-capillary membrane. (55.5%) had problems diffusing gas across the alveolar-capillary membrane. That is, the diffusion of air between the pulmonary alveolar walls and the pulmonary capillary walls were obstructed.

In order to further detect the type of pulmonary disorders, the HRCT examination was conducted to find out whether there were problems concerning diffusion or air trapping in the bronchi of the victims. The results of 31 victims were listed in Table 5. In this table, $HRCT_1$ refers to the hypertrophy of bronchial walls; $HRCT_2$ shows bronchial dilation; $HRCT_3$ represents ground grass appearance due to probable ischema or fibrosis; and $HRCT_4$ pertains to the pulmonary nodules which show the possibility of granuloma. According to the findings of this table, 9 cases (29.0%) showed bronchial hypertrophy, though without any symptom of gasping. Five (16.1%) cases showed bronchial dilation, again without the symptom of gasping. Twelve cases (38.7%) showed ground grass appearance in the lungs, one of them had the symptom of gasping. Six cases (19.4%) showed pulmonary nodules in the lungs, though without the symptom of gasping.

Association of Gene Factors with the Poisoning

Are gene factors associated with Sauropus androgynus poisoning? 26 Sauropus androgynus cases and 27 medical staff (the controls) of the Taipei Veterans General Hospital were selected for HLA (human leukocyte antigen) blood testings., The findings are shown in Table 6. Among these the 26 cases, HLA types A2 (69.2%), A24 (34.6%), A33 (34.6%), Al 1 and DR9 (30.8% each) appeared more frequently. When compared with the control group (44.4%, 33.3%, 0.0%, 59.3%, and 0.0%, respectively), the differences were not statistically significant (all p values larger than 0.05). However, this result is not conclusive due to small number of cases. In order to answer the question whether the HLA gene types of the poisoning victims would make the victims become more prone to the consumption of the vegetable, further investigation is needed.

Dosage Effect on the Consumption of the Vegetable

Concerning the study on the dosage effect of the amount consumed leading to the possibility of poisoning, the FEV_1, FVC, FEV_1/FVC, RV, DLco, and HRCT were held as dependent variables, along with the total amount of the vegetable consumed as an

independent variable, and gender and body mass index (BMI) as confounding factors for adjusting the relations between the dependent and the independent variables. In the logistic regression analysis, as a cut-off point of normalcy, 80% was used in the dependent variables of FEV1, FVC, and DLco; 20% was used for RV; and 70% used in FEV_1/FVC. If any one of $HRCT_1$, $HRCT_2$, $HRCT_3$, and $HRCT_4$ was found positive, then, HRCT was considered positive; otherwise, it was considered negative. Therefore, the results of the

statistically significant effect on PVC ($p<0.05$); though no statistically significant effect on FEV_1/FVC, RV, DLco, and HRCT ($p > 0.05$, respectively). Interestingly, in all logistic regression analysis models, with the exception of RV, BMI was always negatively associated with FEV_1, FVC, FEV_1/FVC, DLco, and HRCT. This implied that for individuals with larger BMI values, their pulmonary functions were more liable to be abnormal.

Discussion

In comparison, the average Malaysian consumes about 116 to 200 grams each week, and yet, no cases of poisoning have been reported[1]. The amount of the vegetable consumed for weight-control purpose in Taiwan was as high as 150 grams per day, seven times higher than that of Malaysia. This excessive amount could have made the individual feel uncomfortable. Two hundred and seventy cases had eaten both the stem and the leaves; those who had eaten either the stem or the leaf had the same problem. In all reported cases no one ate the root of the vegetable. Regardless, if the stem or the leaves were eaten, the juice was frozen or filtered, any additives were added, even the way it was prepared, the symptoms of the poisoning still developed.

Among those 258 cases who were poisoned some had a history of asthma (5.40%) and other kinds of pulmonary disease (1.80%). Though literature[2,4,5-9] showed that Saziropus androgynus poisoning was highly related to pulmonary disease, the present study noted that with or without history of pulmonary disease, symptoms of poisoning still developed. Clinical symptoms in the first stage included primarily insonmia, excitement, loss of appetite, along with dyspnea, heart burn, dizziness, and palpitation. In other words, in the early stage of vegetable use, symptoms similar to sympathetic nerve disorders developed. Whether these symptoms led to weight loss through dislike of food or consumption of energy deserves further study. Consequently, in the second, third, and fourth stages, dyspnea, heart burn, palpitation, and dizziness continued to be the major symptoms, and even speech difficulty. Therefore, the major symptoms at various stages were determined as cardiopulmonary. These results corresponded to the findings of other studies23. In two- fifths of the cases, the symptoms disappeared after termination of use.

Also, Table 4 indicated that many cases were of abnormal FEV1, PVC, and FEV1/FVC, indicating obstruction of the lungs. This result again corresponded to the findings of other studies.[2,4,8,9] With regard to logistic regression analysis the results showed that the amount of the vegetable consumed was related to the abnormality of FEV1 and PVC, but not to FEV1/FVC (Table 6). It could be that the sample size was not large enough, or that hospital information on pulmonary function examination or HRCT was not available. Some of the 31 HRCT cases in Table 5 showed a clinical symptom of respiratory gasping. However, statistical analysis from the HRCT showed no correlative relationship with respiratory

gasping. Again, it could be that the sample size was inadequate, or that changes in HRCT happened before gasping, and this was why there was little difference between gasping and non- gasping.

Difference in the distribution of genes could affect an individual's susceptibility to the vegetable. Given limited funding, no blood specimens were collected from all cases for HLA typing. From the collected data (Table 6), it was not possible to explain the relations between genes and poisoning through a specific HLA model or frequency distribution. In other words, it was not possible to detect from cases genes that were special to them, or any higher frequency distribution of some genes. Similar studies by other medical centers (the Kaohsiung Veterans General Hospital, for instance) also did not detect any relationship between genes and poisoning either. In the cases under study, some were blood relatives. They were not affected. The relations between genes and poisoning require further investigation.

As far as environmental factors are concerned, it was only possible to speculate the cases' distribution with the relationship between living environment and the poisoning and the places where the vegetable was bought. Therefore, the cases spread throughout the island; apparently no common environmental and epidemiological characteristics among them could be deduced from their places of living. Although most cases lived in urban areas, urban living or population density could not be used to explain their environmental characteristics. The urban dwellers had better chances of being exposed to information concerning the vegetable, and more access to it as well. Through home-visitation some cases were noted that family income was not a decisive factor in vegetable use. It was rather for cosmetic reasons and to avoid obesity that made most of them resort to its use. These psychological factors were more reasonable for the use of the vegetable.

The origin of vegetable use began in the southern part of Taiwan. In six months' time, it spread to the north. These 278 cases in the present study included cases from the National Chengkung University Hospital in the south, but did not include cases in the Kaohsiung area[5]. Consequently, they could not represent the entire vegetable-using population. During the process of interviewing, some cases moved, some died, and some refused to be interviewed. The data, therefore, was inclusive.

Among the users so far, there have been seven female fatalities; six females that have undergone pulmonary transplantation at the National Taiwan University Hospital; some were on respirator; and some require frequent hospital care for pulmonary obstruction (such as gasping). Unfortunately, there was no known cure for the illnesses. Therefore, some had sought alternative medical treatment. Consequently, medical and academic institutions should join together to understand the ingredients of Sauropus androgynus, its pathogenic mechanism, and to develop an effective cure.

Conclusion

The results of this study concurred that the use of Sauropus androgynus induced primarily cardio-pulmonary problems such as: dyspnea, heart burn, coughing, and palpitation. In addition, this study found that the symptoms of poisoning can appear no matter whether the stem or the leaf is eaten; or the juice is frozen or filtered; or any additive is added; and the way it is processed. Though Sauropus androgynus was used for weight-reduction, results of statistical analysis did not establish a relationship between the amount consumed and weight-reduction (Table 6). Finally, by adjusting for gender and body mass index (BMI) of the cases, the dosage of the vegetable consumed was found to be significantly associated only with FEV, and FVC, but not with FEV1IFVC, RV, DLco, and HRCT ($p > 0.05$, separately).

Acknowledgment

The study was conducted under a grant from the National Science Council (grant No. NSC 86-2314-B-075-020-M13). Special thanks are due to Dr. C. J. Hsueh, Director of the Internal Medicine Department, the National Chengkung University Hospital; the Taichung Veterans General Hospital, for providing information on the pulmonary functions and HRCT of their patients; and the Bureau of Food Sanitation of the Department of Health, for providing information on the users of the vegetable. Without their assistance, the study could not have been conducted.

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Table 1. Background Information of the 278 Vegetable Users

Item	Male	Female	Total
Age (years)			
No. (%)	19 (6.8)	259 (93.2)	278 (100.0)
Median	42	42	42
Range (Min~Max)	24~70	17~76	17~76
BMI (kg/m^2)*			
No.	17	255	272
Median	27.0	24.6	24.7
Range (Min~Max)	20.8~32.6	17.0~38.4	17.0~38.4
Occupation No.(%)			
Housewife	0 (0.00)	148 (57.14)	148 (53.24)
Non-housewife	19 (100.00)	111 (42.86)	130 (46.76)
Education No.(%)			
Illiterate	0 (0.00)	10 (3.92)	10 (3.66)
Primary school	5 (27.78)	74 (29.02)	79 (28.94)
Junior high	2 (11.10)	41 (16.08)	43 (15.75)
Senior high	5 (27.78)	86 (33.73)	91 (33.33)
College	3 (16.67)	27 (10.59)	30 (10.99)
University	3 (16.67)	15 (5.88)	18 (6.59)
Graduate	0 (0.00)	2 (0.78)	2 (0.73)
Disease History No.(%)			
Asthma	1 (5.26)	14 (5.41)	15 (5.40)
Pulmonary diseases	1 (5.26)	4 (1.54)	5 (1.80)
Other diseases †	17 (89.48)	241 (93.05)	258 (92.80)

* statistically significant difference, $p<0.05$, Wilcoxon rank sum test
+including hypertension, heart diseases, hyperlipemia, diabetes, renal gastro-intestinal diseases, hepatitis, allergic to drugs, etc.

Table 2. Use of the Vegetable

Item	Male No. (%)	Female No. (%)	Total No. (%)
Sources			
Malaysia	8 (42.11)	105 (40.54)	113 (40.65)
Taiwan	4 (21.05)	51 (17.69)	55 (19.78)
India	1 (5.26)	6 (2.32)	7 (2.52)
Indonesia	1 (5.26)	5 (1.93)	6 (2.16)
Thailand	0 (0.00)	3 (1.16)	3 (1.08)
Don't know	5 (26.32)	89 (34.36)	94 (33.81)
Where bought			
Market	5 (27.78)	84 (32.56)	89 (32.25)
Farmer's association	0 (0.00)	16 (6.20)	16 (5.80)
Beauty parlor	1 (5.56)	7 (2.71)	8 (2.89)
Chinese medicine pharmacy	1 (0.00)	5 (1.94)	5 (1.81)
Others	12 (66.67)	146 (56.59)	158 (57.25)
Sources of information			
Friend	12 (63.16)	194 (74.90)	206 (74.10)
Retailer	0 (0.00)	20 (7.72)	20 (7.19)
Media	2 (10.53)	14 (5.41)	16 (5.76)
Beauty parlor	1 (5.26)	5 (1.93)	6 (2.16)
Curiosity	1 (5.26)	3 (1.16)	4 (1.44)
Doctor	0 (0.00)	2 (0.77)	2 (0.72)
Others	3 (15.79)	21 (8.15)	24 (8.63)
Purpose of use			
Weight-reduction	11 (57.89)	210 (81.08)	221 (79.50)
Cure of hypertension	1 (5.26)	13 (5.02)	14 (5.04)
Cure of lipemia	0 (0.00)	1 (0.39)	1 (0.36)
Cosmetic reasons	0 (0.00)	5 (1.93)	5 (1.80)
Others	7 (36.84)	30 (11.59)	37 (13.31)
Part eaten			
Stem	0 (0.00)	1 (0.39)	1 (0.36)
Leave	1 (5.26)	6 (2.32)	7 (2.52)
Whole (not including root)	18 (94.74)	252 (97.30)	270 (97.12)
Way of use			
Self-Make juice	7 (28.00)	123 (37.50)	130 (36.83)
Stir-fried	9 (36.00)	114 (34.76)	123 (34.84)
Bought as juice	7 (28.00)	62 (18.90)	69 (19.55)
Make soup	2 (8.00)	26 (7.93)	28 (7.93)
Concentrate	0 (0.00)	3 (0.91)	3 (0.85)

Table 2. Continued

Item	Male No. (%)	Female No. (%)	Total No. (%)
Whether filtered			
Yes	7 (46.67)	86 (44.79)	93 (44.93)
No	8 (53.33)	106 (55.21)	114 (55.07)
Whether frozen			
Yes	13 (68.42)	215 (84.65)	228 (83.52)
No	6 (31.58)	39 (15.35)	45 (16.48)
Any additives			
None	6 (19.35)	86 (18.94)	92 (18.97)
Pineapple	1 (3.23)	128 (28.19)	129 (26.60)
Guava	8 (25.81)	107 (23.57)	115 (23.71)
Apple	3 (9.68)	30 (6.61)	33 (6.80)
Milk	0 (0.00)	2 (0.44)	2 (0.41)
Ginger	4 (12.90)	19 (4.19)	23 (4.74)
Others	9 (29.03)	80 (17.62)	89 (18.35)
Dosage (Taiwan ounce/day)			
No.	19	259	278
Median (Min~Max)	4.0 (1~16)	4.0 (0.12~16)	4.0 (0.12~16)
Days of use			
No.	16	244	260
Median (Min~Max)	30 (4~365)	20 (1~300)	20 (1~365)
Weight loss (kg)			
No.	10	165	175
Median (Min~Max)	5.5 (2~10)	3.0 (1~15)	3.0 (1~15)
Reasons for termination			
Told it was hazardous	2 (10.50)	13 (5.00)	15 (5.40)
Media	6 (31.60)	26 (29.30)	82 (29.50)
Symptoms	5 (26.30)	85 (32.80)	90 (32.40)
Others	6 (31.60)	85 (32.80)	91 (32.70)
Symptoms after termination			
Disappeared	7 (36.84)	105 (40.54)	112 (40.29)
Not disappeared	12 (63.16)	154 (59.46)	166 (59.71)

* including juice made by oneself and bought in juice form.

Table 3. Ten Leading Symptoms by Stage of Vegetable Consumption

First Stage		Second Stage		Third Stage		Fourth Stage	
Symptom	Times	Symptom	Times	Symptom	Times	Symptom	Times
Insomnia	144	Dyspnea	45	Dyspnea	67	Dyspnea	65
Excitement	52	Heart burn	33	Heart burn	39	Coughing	28
Loss of appetite	43	Coughing	31	Coughing	38	Heart burn	17
Heart burn	33	Dizziness	29	Speech difficulty	20	Dizziness	12
Dizziness	33	Palpitation	24	Palpitation	16	Chest pain	12
Numbness	31	Insomnia	17	Sputum	15	Sputum	12
Palpitation	22	Irregular heartbeat	16	Dizziness	12	Palpitation	11
Coughing	19	Fatigue	16	Irregular heartbeat	12	Irregular heartbeat	7
Irregular heartbeat	16	Numbness	15	Chest pain	12	Fatigue	7
Diarrhea	14	Chest pain	13	Fatigue	9	Dry mouth	7

Table 4. Findings of Pulmonary Function Examinations

Index	Range	No. (%)	No. Examined
FEV_1 / P_FEV_1	< 80%	40 (33.9)	118
	≧ 80%	78 (66.1)	
FVC / P_FVC	< 80%	34 (28.8)	118
	≧ 80%	84 (71.2)	
FEV_1/FVC	< 70%	27 (22.1)	122
	≧ 70%	95 (77.9)	
RV / P_TLC	≦ 20%	4 (3.5)	113
	> 20%	109 (96.5)	
DL_{CO} / P_DL_{CO}	< 80%	45 (55.5)	81
	≧ 80%	36 (44.5)	

Notes: $RFEV_1$ stands for the expected value of FEV_1 RFVC is the expected value of FVC; PTLC is the expected value of TLC; PDLco is the expected value of DLco.

Table 5. Association of HRCT and Respiratory Diseases

HRCT	No. Examined	HRCT Positive		No. Positive (%)	HRCT Negative		No. Negative (%)	p Value
		Gasping	Not Gasping		Gasping	Not Gasping		
$HRCT_1$	31	0	9	9 (29.0)	3	19	22 (71.0)	0.537
$HRCT_2$	31	0	5	5 (16.1)	3	23	26 (83.9)	1.000
$HRCT_3$	31	1	11	12 (38.7)	2	17	19 (61.3)	1.000
$HRCT_4$	31	0	6	6 (19.4)	3	21	24 (80.6)	1.000

Notes: $HRCT_1$ positive indicates hypertrophy of bronchia walls; $HRCT_2$ positive refers bronchial dilation; $HRCT_3$ positive shows ground grass appearance; $HRCT_4$ positive pertains to the pulmonary nodules which show the possibility of granuloma.

Table 6. HLA Distributions of Poisoning Victims and Controls

	Victims (n=20)		Controls (n=27)	
HLA Antigen	No.	% positive	No.	% positive
A2	18	69.2	12	44.4
A11	8	30.8	16	59.3
A24	9	34.6	9	33.3
A33	9	34.6	0	0.0
B15	7	26.9	0	0.0
B35	3	11.5	0	0.0
B46	6	23.1	0	0.0
B53	4	15.4	0	0.0
B60	6	23.1	9	33.3
BW4	1	3.8	17	63.0
BW6*	4	15.4	22	81.4
CW3	0	0.0	11	40.7
CW4	0	0.0	4	14.8
CW7	0	0.0	15	55.6
DQ1	0	0.0	14	51.9
DQ3	0	0.0	8	29.6
DR4	6	23.1	0	0.0
DR9	8	30.8	0	0.0
DR11	7	26.9	0	0.0
DR12	5	19.2	0	0.0
DR15	3	11.5	7	25.9
DR51	2	7.7	7	25.9
DR52*	4	15.4	19	70.4
DR53*	5	19.2	14	51.9

*statistically significant difference, $p < 0.05$.

Table 7. Dosage Effect on Sauropus androgynus Poisoning

Dependent Variable	No. Normal/Abnormal	Gender	BMI	Total Dosage
FEV_1*	36/69			
Regression coefficient		1.6782	-0.0649	0.00529
Standard deviation		3.6589	1.1188	0.00274
p value		0.2986	0.2902	0.05350
FVC†	32/73			
Regression coefficient		1.7569	-0.0167	0.00599
Standard deviation		1.7376	0.0622	0.00284
p value		0.3120	0.7888	0.03840
FEV_1 /FVC	25/80			
Regression coefficient		0.9878	-0.0257	0.00432
Standard deviation		1.3807	0.0673	0.02380
p value		0.4744	0.7029	0.06950
RV	94/4			
Regression coefficient		-	0.0176	-0.00318
Standard deviation		-	0.1493	0.00352
p value		-	0.9059	0.36560
DL_{CO}	42/27			
Regression coefficient		0.9195	-0.0194	0.00524
Standard deviation		0.9836	0.0756	0.00396
p value		0.3499	0.7975	0.18560
HRCT	19/10			
Regression coefficient		-	-0.0329	0.0378
Standard deviation		-	0.1066	0.0243
p value		-	0.7576	0.1203
Weight Loss†‡				
Regression coefficient		-5.9676	2.1797	0.01539
Standard deviation		14.4178	0.7652	0.02504
p value		0.6802	0.0058	0.54080

* statistically marginally significant.

† statistically significant, $p<0.05$.

++ by rank regression analysis.