Ginkgo Biloba Extract:

Brand QC Analytical Report

January, 2006.

Independent analyses by:
Eurofins Labs

Review by:
American Herbal Pharmacopeia

Developed and Funded by:
Ethical Naturals, Inc.

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Ginkgo Biloba Extract:

Brand QC Analytical Report

1.0. Project Intention

The purpose of the **Brand QC Analytical Report on Ginkgo Biloba Extract** was to determine, through random sampling and detailed independent testing, the quality of Ginkgo products available today to the U.S. consumer.

It has been known for a number of years that there are ways that Ginkgo extract can be adulterated with added compounds to meet analytical requirements. The American Herbal Pharmacopeia monograph on Ginkgo (published 2003), for instance, discusses the spiking of Ginkgo extracts with flavonoids to meet label claim (page 20-21).

In addition, information revealed by Ginkgo manufacturers has recently detailed these practices, and made it likely that a significant % of the raw material traded in the U.S. Is heavily spiked or adulterated.

Further evidence is found in the pricing of the raw material itself. Ginkgo extracts are now readily available for $30-$40/kg. Considering the cost of leaf, solvent and labor, it is clearly impossible to make a pure extract, meeting the 24% Ginkgofalvoneglycosides, 6% Terpene lactone standard for that price.

It is hoped that the information derived from this study will give, to the members of the supplement industry, some insight into the conditions now prevailing in the marketplace. Also, that it will provide guidelines to a better understanding of what is required for the ethical purchase and production of Ginkgo extract products for the American public.

2.0. Materials and Procedures

2.1 Brand and Product Selection:

17 finished Ginkgo extract products were purchased for testing and study. The products were chosen because they represent the biggest selling brands and private label lines in the country, both in health food stores and mass market drug and supermarket outlets. These brands are widely used and nationally recognized.

Additionally, 5 samples of Ginkgo extract powder were included in the study, to act as controls, and for additional overview purposes.

2.2 Testing Criteria

All of the 'brands were sent in their original packaging to Eurofins, an FDA certified, independent testing laboratory in Petaluma, California. Eurofins tested each sample for the following criteria:

a) Total Ginkgo Flavonglycosides
    Quercitin
    Kaempferol
    Isorhamnetin
b) Ginkgo Terpene Lactones
    Bilobalide
    Ginkgolide J
    Ginkgolide C
    Ginkgolide A
    Ginkgolide B
c) Lead

After testing by Eurofins was complete, the test results were sent to American Herbal Pharmacopoeia for evaluation of evidence of adulteration of Ginkgoflavonglycoside levels. The report by AHP is included as section 3.3.

3.0. Results and Reports

3.1 Summary of Results

a) Ginkgo flavonglycosides:

In 2003 when American Herbal Pharmacopoeia published their comprehensive monograph on Ginkgo, they found reports of potential adulteration of Ginkgo extracts. Over the years allegations of adulteration have been made by manufacturers, and many others in the industry.

The primary method of adulteration is simple, cheap and effective. The primary flavonglycosides found in Ginkgo are Quercitin, Kaempferol and Isorhamnetin. Added together, these comprise the 24% Flavonglycosides that are the common standard for the product.

However (as discussed in the AHP Review attached, and in the report on adulteration from a Chinese Ginkgo manufacturer), another cheap flavonoid, rutin can be added to increase the total % of Flavonglycosides. This adulteration/dilution cannot be detected directly, as rutin and quercitin test similarly in the method used to assess this category.

Adulteration however can be detected when the individual flavonoids are quantified (as they were in this study), and their ratio compared to established norms. This was the method used by AHP (see AHP Review for detail) to award 'PASS' and 'FAIL' results to each of the extracts tested. Results for the brands, sample numbers 3-16 & 18-20 are as follows:

Sample #:	Result:
3	Pass
4	Pass
5	Fail (did not meet basic 24% total)
6.	Pass
7	Fail (did not meet basic 24% total)
8	Pass
9	Pass
10	Pass
11	Fail
12	Fail
13	Fail
14	Fail
15	Fail

16	Fail
17*	Fail
18	Fail.
19	Fail
20	Fail

*powder sample

(This equals about a 60%failure rate)

For complete details of these test results, please review summary in AHP report, and in **4.0** Complete Data Summary.

Not only did 10 of the 15 products fail, owing to strong evidence of adulteration, but many failed by factors of 200%-300%.

b) Terpene lactones.

Specification for total Terpene lactones in the extracts was 6%.

All brands passed 6% Terpene lactones except:

Sample #:	Result:
5	Fail
7	Fail
17	Fail
20	Fail

(This equals about a 20% failure rate)

c) Lead:

Lead content was assessed for compliance with California Prop 65. Four extracts exceeded the amount permitted in a daily dose by Prop *65:*

Sample #:	Result:
5	Exceeds
7	Exceeds
8	Exceeds
15	Exceeds

(This equals about a 20% failure rate)

American Herbal Pharmacopoeia®

EVALUATION OF SELECTED GINKGO BILOBA PREPARATIONS TO DETERMINE POTENTIAL FOR SPIKING AND ADULTERATION

Prepared by the American Herbal Pharmacopoeia®

on behalf of

Ethical Naturals, Inc.

San Anselmo, CA

Submitted January 30, 2006

American Herbal Pharmacopoeia®

PO Box 66809

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1.0. Project Overview

1.1. American Herbal Pharmacopoeia®

The primary mission of AHP is to promote the ethical and responsible use of herbal products. AHP fulfills this mission by providing to academia, industry, and regulators the tools needed to independently verify the identity, purity, and quality of herbal ingredients and products through the publication of its *AHP Monographs* and Therapeutic *Compendium*, provision of AHP-*Verified* Botanical *and* Chemical Reference Standards, and Botanical Characterization training programs.

1.2 Project Description

At the request of Ethical Naturals, Inc., the American Herbal Pharmacopoeia (AHP) was asked to review the test results of analyses of various preparations of ginkgo (Ginkgo biloba) extract. The expressed purpose was to elicit from AHP an expert opinion based on the analytical findings and the available scientific data of whether or not adulteration of some of these extracts could be determined.

1.3. Project Justification

a) Use and Characterization of *Ginkgo biloba* Extract

Worldwide, the extract of Ginkgo biloba is one of the most popularly used of all botanical products. In most countries it is sold as a drug product generally for the symptomatic treatment of brain disorders related to mental performance and specifically for enhancement of memory, concentration, and some forms of depression, as well as for vascular conditions such as peripheral neuropathy, peripheral arterial occlusive disease, and intermittent claudication to name a few of its indications. The primary product studied and verified for efficacy and safety for these indications is a proprietary ginkgo extract developed by the German pharmaceutical company, Dr. Willmar Schwabe, GmbH, Karlsruhe, Germany (EGb 761). Other products subjected to clinical testing

showing positive results include: GK 501 (Pharmaton; Switzerland); and LI 1370 (Lichtwer Pharma; Germany).

Each of these extracts is standardized to yield from 22-27% total flavonol glycosides (average of 24%) calculated on a dry weight basis by high performance liquid chromatography (HPLC); 5-7% triterpene lactones (average of 6%); and 3-5 ppm of ginkgolic acids. The extract is typically prepared employing a *dry* leaf-to-extract ratio of from 35-67:1 with a typical dry leaf-to-extract ratio of 50:1.

In ginkgo extracts that have been subjected to positive clinical trials, there is a relatively consistent ratio of the flavonol glycosides quercetin, kaempferol, and isorhamnetin of 4:4:1-65:1 (Upton and Graff 2003). Neither these specific flavonoids nor this specific ratio has been directly correlated with bioactivity. However, this chemical profile has been determined to be associated with clinically effective products. Therefore, it is the opinion of AHP that marketers of ginkgo products who base their claims, or are representing their products for the indications established with these clinically verified products should mimic the same chemiczl profile and manufacturing processes as those demonstrated effective in clinical trials.

b) History of Ginkgo Adulteration

In 2033, AHP issued its monograph on *Ginkgo biloba* Leaf and *Ginkgo biloba* Dry Extract. *In* the monograph development process, a report of potential adulteration of ginkgo extracts was found (Xie 2002). Similar unpublished allegations have been made by various ginkgo extract manufacturers over the years. Adulteration can occur by the addition of either pure free quercetin or rutin to an extract. Both of these materials are relatively inexpensive and widely available. Upon analysis, free quercetin will be calculated as quercetin while rutin upon hydrolyzation, the process typically employed in ginkgo analysis, will break down to quercetin and quantified as such. In such cases, the expected quercetin:kaempferol:isorhamnetin ratio (generally 5:5:1) will be considerably eschewed. Thus the addition of pure flavonoid compounds such as rutin or quercetin will

artificially enhance total flavonoid content. By applying a quality control criteria of only total flavonol glycosides adulterated products may go undetected. A close review of ratios along with total quantitation can assist quality control units, independent contract labs, and regulators in identifying constituent profiles that are inconsistent with clinically effective products thus minimizing chance for adulteration and maximizing product efficacy. If ginkgo extract products are subject to the addition of pure compounds this represents product adulteration and is in violation of current dietary supplement regulations. Moreover, such adulteration may render the product ineffective as the integrity of the putative chemical profile shown to be effective has not been maintained.

2.0. Materials and Methods

2.1. Data Reviewed

AHP was provided with the analytical findings of the HPLC analysis of flavonol glycosides and triterpene lactones of 22 samples alleged to be *Ginkgo* biloba. The analyses were performed by Eurofins, an independent contract lab (Petaluma, CA) (Appendix 1).

2.2. Pass-Fail Criteria

The relative ratios of the flavonol glycosides quercetin:kaempferol:isorhamnetin were reviewed for consistency with those noted above as being representative of clinically tested extracts. Factoring natural variation in clinically tested extracts and the potential for analytical error of as high as 20% an acceptable quercetin to kaempferol ratio of 2.00 was adopted. Products with a quercetin to kaempferol ratio greater than this were considered to be inconsistent with the ratio established for products found to be clinically effective and were deemed unacceptable. Insufficient data regarding the analyses of triterpene lactones were lacking and were only cursorily reviewed.

2.3. Data Review

The data provided were subjected to independent reviews of AHP staff consisting of analytical lab technicians, technical manager-chemistry laboratory, AHP analytical advisors, and the executive director.

2.4. Findings

In the samples tested a wide range of flavonol glycoside ratios was evident. Almost 50% of these samples had flavonol glycoside ratios that were not within the range typically associated with ginkgo extract products for which clinical efficacy has been determined. Other data of independent analyses of ginkgo products by AHP showed similarly wide variations in flavonol glycoside ratios suggesting these samples are consistent with extracts typically found in the commercial market. Table 1 provides a review of the samples tested and their relative ratios of acceptable flavonol glycoside concentrations. Using a quercetin:kaempferol ratio of greater than 2.00 as a baseline of acceptability, each sample was assigned a pass or fail determination. A conclusive determination regarding adulteration cannot be made. However, in those samples in the fail category (e.g. samples 11-20) adulteration can be suspected, with adulteration becoming more likely as the deviation becomes greater (e.g. samples 15-20).

3.0. Limitations Regarding the Current Work and Recommendations for Future Work

a) Because of the inherent variability in natural product raw material, extraction efficiency, application of good manufacturing practices, and natural products analysis a definitive determination regarding adulteration of gingko extract with pure flavonoid compounds cannot be made. However, samples showing the greatest deviation from the expected norm should be considered highly suspect of adulteration.

b) Selective sampling: AHP was limited to a review of specific blinded samples chosen by the contractor. AHP has no knowledge of whether these products are broadly representative of ginkgo extract products in the market or disproportionately representative of selected products. Preliminary review of analytical data obtained previously by AHP suggests the wide range of ratios observed is not uncommon. However, ensuring samples gathered are representative of the totality of products on the market, specifically including those whose efficacy has been determined in human clinical trials, would strengthen future work.

c) Application of validated analytical methodology: In ail analytical work, it is important that the method employed be validated to specific performance standards. The gold standard in analytical methodology validation is that of the Official Methods of Analysis (OMA) validation of AOAC International. OMA methods are considered the most relied upon for regulatory purposes and are included as such in the Code of Federal Regulations (CFR). However, there are currently few OMA methods available for analysis of botanicals, though a number, including for ginkgo, are in process. Other methods of validation are available including those of the Methods Validation Program (MVP) of the Institute of Nutriceutical Advancement (INA); the Methods Validation Program of the American Herbal Pharmacopoeia (AHP) which minimally employs a two-lab validation; single-lab validation of AOAC International; and validation work of the United States Pharmacopeia (USP). Harmonized validated methods for both flavonol glycosides and triterpene lactones from ginkgo extracts are available through AHP, INA, and USP. Future analytical work should employ this currently harmonized methodology.

d) Two-lab review of products: With all analytical methodology, there are factors that will influence the accuracy of quantitation. This includes inherent variations in the methods; calibration of equipment; experience of analysts; purity of reference standards; and environmental conditions to name only a few of the variables of influence.

Employing a two-lab analysis of the same samples using the same methodology and equipment, using chemical reference standards whose purity has been accurately disclosed (e.g. AHP-Verified™ and USP), and then assigning a calculated average of the findings of the two labs would strengthen the accuracy of results. Additional considerations to decrease the influence of natural variability in the method would be to include application of duplicate sample and standard preparations as a way to monitor inherent method variance.

e) Review of manufacturer data: Because of the natural variation that exists in plants and the great variation in extraction efficiency in the manufacture of various products, a definitive determination regarding intentional adulteration would require a review of manufacturing data and possible testing of retention samples.

4.0. Conclusion

It has been alleged that adulteration in the ginkgo extract market is not uncommon. Analytical data of 22 samples were reviewed to determine if the consistency of flavonol glyccside ratios found was indicative of ratios that are to be expected with those products that have been shown to be clinically effective or may have been due to spiking of pure flavonoid compounds to artificially enhance total flavonoid content. Without further work incorporating the suggestions outlined in Section 3.0 and the application of statistical analysis, a definitive determination regarding the potential for adulteration cannot be made. However, on the basis of this review, it is clear that spiking with pure flavonoid compounds can be suspected if the ratios of quercetin to kaempferol is greater than 2.00 with greater deviations increasing the likelihood of adulteration.

Table 1 Review of gingko samples for consistency of flavonol glycoside ratios

Sample #	Job #	Code	Q:K:I	Value Differentiation (Q:K)	Pass-Fail
1	25346	GBDP0027	3.6:4.4:1	0.81	Pass
2	25346	GBDP0028	3.6:3.8:1	0.94	Pass
3	25347	GBE40017	6.1:6.1:1	1.00	Pass
4	25347	GBR40011	6.1:5.1:1	1.19	Pass
5	25348	GBN60022	2.8:2.4:1	1.16	Pass
6	25348	GBJ60019	6.7:4.9:1	1.36	Pass
7	25349	GBN60013	6.3:4.2:1	1.50	Pass
8	25349	GBT60025	8.1:5:1	1.62	Pass
9	25350	GBS40016	7.7:4.7:1	1.63	Pass
10	25350	GBR60015	9.6:5:1	1.92	Pass
11	25351	GBT60010	14.8:5.8:1	2.96	Fail
12	25351	GBN60021	18.8:7.0:1	2.68	Fail
13	25352	GBN60020	10.6:4.0:1	2.65	Fail
14	25352	GBJ60018	11.9:3.8:1	3.13	Fail
15	25353	GBW60026	13:3.7:1	3.51	Fail
16	25353	GBL60012	17.2:5:1	3.44	Fail
17	25354	GBAP0029	15.4:4.2:1	3.66	Fail
18	25354	GBS60014	22.1:4.9:1	4.51	Fail
19	25355	GBN60023	15.8:3.4:1	4.64	Fail
20	25355	GBN60023*	19.5:3.2:1	6.09	Fail
21	25356	GBS60024	5.1:5.3:1	0.96	Pass
22	25356	No Code # on Eurofins report; GBE0031 on Ethical Naturals" report	5.8:4.2:1	1.38	Pass

* Same code as sample 19

References

Upton R, Graff A. (eds.). 2003. *Ginkgo Leaf and Ginkgo Leaf Dry Extract*. Monograph of the American Herbal Pharmacopoeia. Scotts Valley, CA.

Xie PS. 2002. Overview on the quality control of traditional Chinese medicines, in *1st international conference on the modernization of traditional Chinese medicine*, Hong Kong Jockey Club, Hong Kong (2002).

Appendices

Appendix 1

Analytical findings of Eurofins

Appendix 2

Ginkgo Monograph of the American Herbal Pharmacopoeia

_____ Date: January 30.2006

Roy Upton, Executive Director
American Herbal Pharmacopoeia
(original signed)

3.3. Summary Report.

Summary of report From major Chinese Ginkgo Manufacturer:

'The History and Methodology of Ginkgo Extract Adulteration'

Ginkgo adulteration during manufacturing has become very widespread in recent years, as it enables the production of an extract which will test at 24% Total Ginkgofalvoneglycosides at a much lower cost than from pure Ginkgo leaf. The background is as follows:

In 1998, a researcher in Nanjing Pharmaceutical University found that the addition of both rutin and quercetin from outside sources could significantly increase the measured content of quercetin fiavone glycosides. Because quercetin is a major component in making up the 24% total flavoneglycosides specified in the extract, this was a significant discovery.

Because Ginkgo leaf extract normally contains more than 6% of terpene lactones and less than 24% of flavoneglycosides, in order to produce 2416 standardized extract, more leaves are needed, which naturally leads to a higher cost.

Since the flavone glycosides and terpene lactones can be separated under certain specific conditions during production, what manufacturers have been doing is to control terpene lactones at the exact 6% level, and then add rutinlquercetin from other sources to make up the difference of ginkgo flavoneglycosides.

Because rutin extract contains 98% quercetin glycosides, but only costs about $10.00 per kilogram, the manufactures can maintain ginkgo prices as low as they have ever been. But, interestingly enough, the quercetin glycoside content (Q) isn't always proportional to the quality of ginkgo extract. The ratio of Q to K (Q/K) of ginkgo 2416 which is made from quality fresh ginkgo leaves is typically between 1.25 - 1.65 whereas Q/K of ginkgo 2416 made from mature leaves (not preferred) is normally between 0.8 - 1.35. Therefore, it isn't accurate to judge the ginkgo extract quality solely based on Q/K when it is < 1.65.

However it is quite certain, that the extract has been adulterated with added rutinlquercetin when Q/K is over 2.00, and adulteration is likely over 7.65. The higher the ratio, the more severe the adulteration.

4.0. Complete Data Summary

The following pages contain full data from the product testing at Eurofins. Report columns referred to previously in this report include:

1) Total flavone glycosides: Claim & Finding

2) Quercitin/Kaempferol ratio: Q:K

3) Terpene lactones: Claim & Finding

4) Lead content

Ethical Naturals, Inc.

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Preliminary Analysis of Eurofins' Ginkgo Product Testing Results

- Product Description -					- Result -										- Comments -					
Brand Name	Lot #	ENI Code	Label Claim Unit (mg)	Label Claim Specification	Flavone Glycosides Claim	Flavone Glycosides Finding	Q	K	I	Q : K	Terpene Lactones Claim	Terpene Lactones Finding	Lead Content		Adulterated w/added Flavones	24% Flavones Glycosides Content		6% Terpene Lactones Content		Lead
01	20051018	GBDP0027	Powder	24/6	24.0%	24.2%	9.74%	11.8%	2.67%	0.825	6.0%	7.32%	0.20	µg/g	No	Yes		Yes		Pass
02	510007	GBLP0028	Powder	24/6	24.0%	25.1%	10.8%	11.3%	3.00%	0.960	6.0%	9.83%	0.12	µg/g	No	Yes		Yes		Pass
03	57987	GBE40017	40	24/6	9.60	9.43	4.36	4.35	0.719	1.00	2.40	2.86	0.08	µg/day	No	Yes		Yes		Pass
04	59593	GBR60011	60	24/6	14.4	14.0	6.96	5.86	1.15	1.19	3.60	4.25	0.04	µg/day	No	Yes		Yes		Pass
05		GBN60022	60	24/6	14.4	8.10	3.69	3.10	1.31	1.19	3.60	1.64	3.24	µg/day	No		Very Low		Very Low	High
06	53612001	GBJ60019	60	24/6	14.4	13.4	7.16	5.21	1.07	1.37	3.60	4.69	0.05	µg/day	No	Low		Yes		Pass
07	22589902	GBN60013	60	24/6	14.4	7.55	4.15	2.75	0.658	1.51	3.60	3.05	2.36	µg/day	No		Very Low		Very Low	High
08	204414614	GBT60025	120	24/6	28.8	25.9	14.9	9.15	1.83	1.63	7.20	10.07	1.64	µg/day	No		Very Low	Yes		High
09	114452 01	GBS40016	40	24/6	9.60	8.85	5.20	2.97	0.677	1.75	2.40	2.66	0.08	µg/day	Yes	Low		Yes		Pass
10	0470BE312	GBR60015	40	24/6	9.60	10.3	6.30	3.30	0.658	1.91	2.40	2.51	0.12	µg/day	Yes	Yes		Yes		Pass
11	512295	GBT60010	60	24/6	14.4	14.9	10.2	4.00	0.688	2.54	3.60	4.48	0.12	µg/day	Yes	Yes		Yes		Pass
12	521132	GBN60021	60	24/6	14.4	12.4	8.74	3.24	0.465	2.70	3.60	3.27	0.48	µg/day	Yes		Very Low	Low		Pass

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Preliminary Analysis of Eurofins' Ginkgo Product Testing Results

	- Product Description -				- Result -										- Comments -				
	Brand Name	Lot #	ENI Code	Label Claim Unit (mg)	Label Claim Specification	Flavone Glycosides Claim	Flavone Glycosides Finding	Q	K	I	Q : K	Terpene Lactones Claim	Terpene Lactones Finding	Lead Content		Adulterated w/added Flavones	24% Flavones Glycosides Content	6% Terpene Lactones Content		Lead
13	[illegible]	GBI660020	60	[illegible]	14.4	13.16	8.96	3.36	0.84[illegible]	2.67	3.60	3.71	.16	µgld [illegible]	[illegible]	Low		Yes		Pass
14	8334H5	GB6(0018	60	[illegible]	14.4	1[illegible].6	9.0 0	2.86	0.757	3.15	3.60	4.64	[illegible]6	µg/day	Yes		Very Low	Yes		Pass
15	[illegible]	GBV6 .0026	60	[illegible]	14.4	[illegible]2.1	8.9 0	[illegible].51	0.688	3.55	3.60	5.32	[illegible]7	µg/day	[illegible]		Very low	Yes		High
16	5GA0 89	GBL600 1	60	[illegible]	144	[illegible]5.4	[illegible].4	3.30	0.662	3.4 6	3.[illegible]6	4.0 7	[illegible]	µg/day	[illegible]	Yes		Yes		Pass
17	H051 1[illegible]	GBAP0029	Powder	[illegible]	[illegible] %	[illegible].4 %	[illegible].50 %	4.76%	1.13[illegible]%	3.6 8	0 6.0[illegible]	4.322%	0.1 [illegible]	µg//g	Yes	Yes			Very Low	Pass
18	5DA0 91	GBS6001[illegible]	60	[illegible]	14.4	15[illegible].6	[illegible].3	2.73	0.556	4.5 [illegible]	3.6 0	2.0[illegible]2	0.2 [illegible]	µg/d ay	[illegible]	Yes			Very Low	Pass
19	[illegible]29 [illegible]	GBN60023	120	[illegible]	28.8	28.7	22.5	4.79	1.424	4.770	7.2 0	6.5 3	0.04	µg/da	[illegible]	Yes		Low		Pass
20	[illegible] 15	GBS60024	60	[illegible]	14.4	7.422	6.11	[illegible]60	0.314	6[illegible]	3.60	1.82	0[illegible]4	µg/day	[illegible]		Vey ow		Vey Low	Pass
21	23[illegible]2/M1	GBP0 3	P [illegible]der	7.5/2	7.50%	7.8%%	3.48%	3.62%	0.676%	0.9 6	[illegible]0 %	2.05%	0.05	µg/g	No	Yes		s		Pass
22	200[illegible]	GBEP 03 1	Powder	24/6	24.0%	24.5[illegible]%	[illegible]2.9%	[illegible]9%	2.24%	[illegible]7	6.0 %	9.20%	0.3[illegible]	µg/g	No	Yes		Yes		Pass

eurofins

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January 24,2006

Mr. Cal Bewicke
Ethical Naturals, Inc
380 North Pastoria Avenue
Sunnyvale CA 94085

CERTIFICATE OF ANALYSIS
Job # 25346

Sample Identification:
Sample #: 05-5513 Sample #1, Powder, ACTA NSI Code GBDP0027
Date Received: 12-15-05, Time Received: 03:00 PM

Method:
AL187: Metals by ICP MS
LC130: Ginkgo Flavonglycosides by High Performance Liquid Chromatography (HPLC)
LC133: Ginkgo Terpene Lactones by High Performance Liquid Chromatography (HPLC)

Results:

Sample #05-5513

Test	Result	Units
Lead	0.25	µg/g
Lead (D)	0.15	µg/g
Ginkgo Flavonglycosides test date 1/4/06		
Quercetin	9.56	% wtlwt
Kaempferol	11.8	% wtlwt
Isorhamnetin	2.68	% wtlwt
Total Flavonglycosides	24.0	% wt/wt
Ginkgo Flavonglycosides test date 1/10/06		
Quercetin	9.92	% wtlwt
Kaempferol	11.8	% wtlwt
Isorhamnetin	2.65	% wt/wt
Total Flavonglycosides	24.4	% wt/wt
Ginkgo Terpene Lactones		
Bilobalide	2.39	% wt/wt
Ginkgolide J	0.215	% wt/wt
Ginkgolide C	0.834	% wt/wt
Glnkgolide A	2.53	% wt/wt
Ginkgolide B	1.35	% wt/wt
Total	7.32	% wtlwt

(D) = Duplicate sample preparation for internal quality check.

Dani Ignacio
Analyst II

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January 24,2006

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CERTIFICATE OF ANALYSIS
Job # 25346

Sample Identification:
Sample #: 05-5514 Sample #2, Powder, ACTA NSI Code GBDP0028
Date Received: 12-15-05, Time Received: 03:00 PM

Method:
AL187: Metals by ICP MS
LC130: Ginkgo Flavonglycosides by High Performance Liquid Chromatography (HPLC)
LC133: Ginkgo Terpene Lactones by High Performance Liquid Chromatography (HPLC)

Results:

Sample #05-5514

Test	Result	Units
Lead	0.12	µg/g
Ginkgo Flavonglycosides test date 1/4/06		
Quercetin	10.8	% wt/wt
Kaempferol	11.3	% wt/wt
Isorhamnetin	3.02	% wt/wt
Total Flavonglycosides	25.1	% wt/wt
Ginkgo Flavonglycosides test date 1/10/06		
Quercetin	10.8	% wt/wt
Kaempferol	11.2	% wt/wt
Isorhamnetin	2.98	% wt/wt
Total Flavonglycosides	25.0	% wt/wt
Ginkgo Tergene Lactones		
Bilobalide	4.93	% wt/wt
Ginkgolide J	0.139	% wt/wt
Ginkgolide C	0.624	% wt/wt
Ginkgolide A	2.88	% wt/wt
Ginkgolide B	1.26	% wt/wt
Total	9.83	% wt/wt

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CERTIFICATE OF ANALYSIS
Job # 25347

Sample Identification:
Sample #: 05-5515 Sample #3, Capsules, ACTA NSI Code GBE40017
Date Received: 12-15-05, Time Received: 03:00 PM

Method:
AL187: Metals by ICP MS
LC130: Ginkgo Flavonglycosides by High Performance Liquid Chromatography (HPLC)
LC133: Ginkgo Terpene Lactones by High Performance Liquid Chromatography (HPLC

Results:

Sample #05-5515

Test	**Result**	**Unit**
Lead	<0.025	µg/capsule
Ginkgo Flavonglycosides test date 1/04/06		
Quercetin	4.29	mg/capsule
Kaempferol	4.32	mg/capsule
Isorhamnetin	0.712	mg/capsule
Total Flavonglycosides	9.32	mg/capsule
Ginkgo Flavonglycosides test date 1/10/06		
Quercetin	4.43	mg/capsule
Kaempferol	4.38	mg/capsule
Isorhamnetin	0.726	mg/capsule
Total Flavonglycosides	9.54	mg/capsule
Ginkgo Terpene Lactones		
Bilobalide	1.38	mg/capsule
Ginkgolide J	0.138	mg/capsule
Ginkgolide C	0.517	mg/capsule
Ginkgolide A	0.533	mg/capsule
Ginkgolide B	0.292	mg/capsule
Total Ferpene Lactones	2.86	mg/capsule

Average content weight = 400.45 mg/capsule.

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CERTIFICATE OF ANALYSIS
Job # 25347

Sample Identification:
Sample #: 05-5516 Sample #4, Tablets, ACTA NSI Code GBR40011
Date Received: 12-15-05, Time Received: 03:00 PM

Method:
AL187: Metals by ICP MS
LC130: Ginkgo Flavonglycosides by High Performance Liquid Chromatography (HPLC)

Results:

Sample #05-5516

Test	**Result**	**Unit**
Lead	<0.02	µg/tablet
Ginkgo Flavonglycosides test date 1/04/06		
Quercetin	6.96	mgltablet
Kaempferol	5.86	mg/tablet
Isorhamnetin	1.15	mg/tablet
Total Flavonglycosides	14.0	mg/tablet

Average weight = 314.23 mgltablet.

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CERTIFICATE OF ANALYSIS
Job # 25348

Sample Identification:
Sample #: 05-5517 Sample #5, Capsules, ACTA NSI Code GBN60022
Date Received: 12-15-05, Time Received: 03:00 PM

Method:
AL187: Metals by ICP MS
LC130: Ginkgo Flavonglycosides by High Performance Liquid Chromatography (HPLC)

Results:

Sample #05-5517

Test	Result	Units
Lead	1.62	µg/capsule
Ginkgo Flavonglycosides test date 1/4/06		
Quercetin	3.69	mg/capsule
Kaempferol	3.10	mg/capsule
Isorhamnetin	1.31	mg/capsule
Total Flavonglycosides	8.10	mg/capsule

Average content weight = 261.24 mg/capsule.

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CERTIFICATE OF ANALYSIS
Job # 25348

Sample Identification:
Sample #: 05-5518 Sample #6, Capsules, ACTA NSI Code GBJ60019
Date Received: 12-15-05, Time Received: 03:00 PM

Method:
AL187: Metals by ICP MS
LC130: Ginkgo Flavonglycosides by High Performance Liquid Chromatography (HPLC)

Results:

Sample #05-5518

Test	Result	Units
Lead	<0.025	µg/capsule
Ginkgo Flavonglycosides test date 1/04/06		
Quercetin	6.96	mg/capsule
Kaempferol	5.12	mg/capsule
Isorhamnetin	1.05	mg/capsule
Total Flavonglycosides	13.1	mg/capsule
Ginkgo Flavonglycosides test date 1/10106		
Quercetin	7.35	mglcapsule
Kaempferol	5.30	mg/capsule
Isorhamnetin	1.09	mg/capsule
Total Flavonglycosides	13.7	mglcapsule

Average content weight = 375.80 mg/capsule.

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CERTIFICATE OF ANALYSIS
Job # 25350

Sample Identification:
Sample #: 05-5521 Sample #9, Capsules, ACTA NSI Code GBS40016
Date Received: 12-15-05, Time Received: 03:00 PM

Method:
AL187: Metals by ICP MS
LC130: Ginkgo Flavonglycosides by High Performance Liquid Chromatography (HPLC)

Results:

Sainple #05-5521

Test	**Result**	**Units**
Lead	0.025	µg/capsule
Ginkgo Flavonglycosides test date 1/04/06		
Quercetin	5.20	mg/capsule
Kaempferol	2.97	mg/capsule
Isorhamnetin	0.677	mg/capsule
Total Flavonglycosides	8.84	mg/capsule

Average content weight = 436.00 mg/capsule.

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CERTIFICATE OF ANALYSIS
Job # 25350

Sample Identification:
Sample #: 05-5522 Sample #10, Tablets, ACTA NSI Code GBR60015
Date Received: 12-15-05, Time Received: 03:00 PM

Method:
AL187: Metals by ICP MS
LC130: Ginkgo Flavonglycosides by High Performance Liquid Chromatography (HPLC)

Results:

Sample #05-5522

Test	Result	Result (D)	Units
Lead	0.04	--	µg/tablet
Ginkgo Flavonglycosides test date 1/04/06			
Quercetin	6.29	6.31	mgltablet
Kaempferol	3.28	3.31	mgltablet
Isorhamnetin	0.655	0.661	mgltablet
Total Flavonglycosides	10.2	10.3	mgltablet

Average weight = 317.01 mgltablet.

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CERTIFICATE OF ANALYSIS

Job # 25349

Sample Identification:
Sample #: 05-5519 Sample #7, Tablets, ACTA NSI Code GBNGOO13
Date Received: 12-15-05, Time Received: 03:00 PM

Method:

AL187: Metals by ICP MS
LC130: Ginkgo Flavonglycosides by High Performance Liquid Chromatography (HPLC)
LC133: Ginkgo Terpene Lactones by High Performance Liquid Chromatography (HPLC)

Results:

Sample #05-5519

Test	Result	Units
Lead	1.18	µg/tablet
Ginkgo Flavonglycosides test date 1/04/06		
Quercetin	4.06	mgltablet
Kaempferol	2.71	mg/tablet
Isorhamnetin	0.645	mgltablet
Total Flavonglycosides	7.41	mgltablet
Ginkgo **Flavonglycosides** test date 1/10/06		
Quercetin	4.23	mgltablet
Kaempferol	2.78	mgltablet
Isorhamnetin	0.670	rngltablet
Total Flavonglycosides	7.68	mg/tablet
Ginkgo Terpene **Lactones**		
Bilobalide	1.18	rngltablet
Glnkgolide J	0.116	rngltablet
Glnkgolide C	0.418	mgltablet
Ginkgolide A	0.799	mgltablet
Ginkgolide B	0.541	rngltablet
Total Terpene **Lactones**	3.05	mg/tablet

Average weight = 593.89 mgltablet.

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CERTIFICATE OF ANALYSIS
Job # 25349

Sample Identification:
Sample #: 05-5520 Sample #8, Capsules, ACTA NSI Code GBT60025
Date Received: 12-15-05, Time Received: 03:00 PM

Method:
AL187: Metals by ICP MS
LC130: Ginkgo Flavonglycosides by High Performance Liquid Chromatography (HPLC)

Results:

Sample #05-5520

Test	Result	Units
Lead	1.67	µg/capsule
Lead (D)	1.61	µg/capsule
Ginkgo Flavonglycosides test date 1/04/06		
Quercetin	14.6	mg/ capsule
Kaempferol	9.08	mg/ capsule
Isorhamnetin	1.83	mg/ capsule
Total Flavonglycosides	25.5	mg/ capsule
Ginkgo Flavonglycosides test date 1/12/06		
Quercetin	15.2	mg/ capsule
Kaempferol	9.22	mg/ capsule
Isorhamnetin	1.83	mg/ capsule
Total Flavonglycosides	26.2	mg/ capsule

(D) = Duplicate sample preparation for internal quality check.
Average content weight = 493.21 mg/capsule.

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CERTIFICATE OF ANALYSIS
Job # 25351

Sample Identification:
Sample #: 05-5523 Sample #11, Tablets, ACTA NSI Code GBT60010
Date Received: 12-15-05, Time Received: 03:00 PM

Method:
AL187: Metals by ICP MS
LC130: Ginkgo Flavonglycosides by High Perfonnance Liquid Chromatography (HPLC)
LC133: Ginkgo Terpene Lactones by High Perfonnance Liquid Chromatography (HPLC)

Results:

Sample #05-5523

Test	Result	Units
Lead	0.06	µg/tablet
Ginkgo Flavonglycosides test date 1/04/06		
Quercetin	9.61	mg/tablet
Kaempferol	3.86	rngltablet
Isorhamnetin	0.660	mg/tablet
Total Flavonglycosides	14.1	mg/tablet
Ginkgo Flavonglycosides test date 1/09/06		
Quercetin	10.4	rngltablet
Kaempferol	4.06	mgltablet
Isorhamnetin	0.702	mg/tablet
Total Flavonglycosides	15.2	rngltablet
Ginkgo Flavonglycosides test date 1/09/06 **(D)**		
Quercetin	10.5	rngltablet
Kaempferol	4.07	mgltablet
Isorhamnetin	0.701	mgltablet
Total Flavonglycosides	15.3	mgltablet
Ginkgo Terpene Lactones		
Bilobalide	1.26	mg/tablet
Glnkgolide J	0.188	mg/tablet
Glnkgolide C	0.587	mgltablet
Ginkgolide A	1.59	mgltablet
Ginkgolide B	0.855	mgltablet
Total Terpene Lactones	4.48	mgltablet

(D) = Duplicate sample preparation for internal quality check.
Average weight =410.17 mg/tablet.

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CERTIFICATE OF ANALYSIS
Job # 25351

Sample Identification:
Sample #: 05-5524 Sample #12, Capsules, ACTA NSI Code GBN60021
Date Received: 12-15-05, Time Received: 03:00 PM

Method:
AL187: Metals by ICP MS
LC130: Ginkgo Flavonglycosides by High Performance Liquid Chromatography (HPLC)

Results:

Sainple #05-5524

Test	Result	Units
Lead	0.24	µg/capsule
Ginkgo Flavonglycosides test date 1/04/06		
Quercetin	8.74	mg/capsule
Kaempferol	3.24	mg/capsule
Isorhamnetin	0.465	mg/capsule
Total Flavonglycosides	12.4	mg/capsule

Average content weight = 455.35 mg/capsule.

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CERTIFICATE OF ANALYSIS
Job # 25352

Sample Identification:
Sample #: 05-5525 Sample #13, Capsules, ACTA NSI Code GBN60020
Date Received: 12-15-05, Time Received: 03:00 PM

Method:
AL187: Metals by ICP MS
LC130: Ginkgo Flavonglycosides by High Performance Liquid Chromatography (HPLC)

Results:

Sample X05-5525

Test	Result	Units
Lead	0.08	µg/capsule
Total Flavonglycosides	12.8	mg/capsule
Ginkgo Flavonglycosides test date 1/4/06		
Quercetin	8.44	mglcapsule
Kaempferol	3.19	mg/capsule
Isorhamnetin	0.817	mglcapsule
Total Flavonglycosides	12.4	rnglcapsule
Ginkgo Flavonglycosides test date 1/12/06		
Quercetin	9.47	mglcapsule
Kaempferol	3.52	mg/capsule
Isorhamnetin	0.877	rnglcapsule
Total Flavonglycosides	13.9	mglcapsule

Average content weight = 604.36 rnglcapsule.

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CERTIFICATE OF ANALYSIS
Job # 25352

Sample Identification:
Sample #: 05-5526 Sample #14, Capsules, ACTA NSI Code GBJ60018
Date Received: 12-15-05, Time Received: 03:00 PM

Method:
AL187: Metals by ICP MS
LC130: Ginkgo Flavonglycosides by High Performance Liquid Chromatography (HPLC)
LC133: Ginkgo Terpene Lactones by High Performance Liquid Chromatography (HPLC)

Results:

Sample #05-5526

Test	Result	Units
Lead	<0.03	µg/capsule
Ginkgo Flavonglycosides test date 1/04/06		
Quercetin	8.90	mg/capsule
Kaempferol	2.51	mg/capsule
Isorhamnetin	0.684	mg/capsule
Total Flavonglycosides	12.1	mg/capsule
Ginkgo Flavonglycosides test date 1/12/06		
Quercetin	9.09	mg/capsule
Kaempferol	3.21	mg/capsule
Isorhamnetin	0.829	mg/capsule
Total Plavonglycosides	13.1	mg/capsule
Ginkgo Terpene Lactones		
Bilobalide	1.77	mg/capsule
Ginkgolide J	0.294	mg/capsule
Ginkgolide C	0.910	mg/capsule
Ginkgolide A	1.05	mg/capsule
Ginkgolide B	0.621	mg/capsule
Total Terpene Lactones	4.64	mg/capsule

Average content weight = 470.97 mg/capsule.

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CERTIFICATE OF ANALYSIS
Job # 25353

Sample Identification:
Sample #: 05-5527 Sample #15, Capsules, ACTA NSI Code GBW60026
Date Received: 12-15-05, Time Received: 03:00 PM

Method:
AL187: Metals by ICP MS
LC130: Ginkgo Flavonglycosides by High Performance Liquid Chromatography (HPLC)
LC133: Ginkgo Terpene Lactones by High Performance Liquid Chromatography (HPLC)

Results:

Sample #05-5527

Test	Result	Units
Lead	2.13	µg/capsule
Lead (D)	2.07	µg/capsule
Ginkgo Flavonglycosides test date 1/04/06		
Quercetin	8.90	mg/capsule
Kaempferol	2.51	mglcapsule
Isorhamnetin	0.684	mglcapsule
Total Flavonglycosides	12.1	mglcapsule
Ginkgo Terpene Lactones		
Bilobalide	1.92	mglcapsule
Ginkgolide J	0.297	mglcapsule
Ginkgolide C	0.859	mglcapsule
Ginkgolide A	1.44	mglcapsule
Ginkgolide B	0.817	mg/capsule
Total Terpene Lactones	5.32	mg/capsule

(D) = Duplicate sample preparation for internal quality check.
Average capsule weight = 384.29 mg/capsule.

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CERTIFICATE OF ANALYSIS
Job # 25353

Sample Identification:
Sample #: 05-5528 Sample #16, Capsules, ACTA NSI Code GBL60012
Date Received: 12-15-05, Time Received: 03:00 PM

Method:
AL187: Metals by ICP MS
LC130: Ginkgo Flavonglycosides by High Performance Liquid Chromatography (HPLC)
LC133: Ginkgo Terpene Lactones by High Performance Liquid Chromatography (HPLC)

Results:

Sample #05-5528

Test	Result	Units
Lead	0.11	µg/capsule
Ginkgo Flavonglycosides test date 1/04/06		
Quercetin	11.1	rnglcapsule
Kaempferol	3.33	mglcapsule
Isorhamnetin	0.663	mglcapsule
Total Flavonglycosides	15.1	rnglcapsule
Ginkgo Flavonglycosides test date 1/12/06		
Quercetin	11.7	mglcapsule
Kaempferol	3.31	mglcapsule
Isorhamnetin	0.660	mglcapsule
Total Flavonglycosides	15.6	mglcapsule
Ginkgo Flavonglycosides test date 1/12/06 (D)		
Quercetin	11.5	mglcapsule
Kaempferol	3.26	mglcapsule
Isorhamnetin	0.663	mglcapsule
Total Flavonglycosides	15.4	rnglcapsule
Ginkgo Terpene Lactones		
Bilobalide	1.32	mglcapsule
Ginkgolide J	0.158	mglcapsule
Ginkgolide C	0.593	mglcapsule
Ginkgolide A	1.27	mglcapsule
Ginkgolide B	0.731	rnglcapsule
Total Terpene Lactones	4.07	rnglcapsule

(D) = Duplicate sample preparation for internal quality check.
Average content weight = 753.84 mg/capsule.

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CERTIFICATE OF ANALYSIS
Job # 25354

Sample Identification:
Sample #: 05-5529 Sample #17, Powder, ACTA NSI Code GBA P0029
Date Received: 12-15-05, Time Received: 03:00 PM

Method:
AL187: Metals by ICP MS
LC130: Ginkgo Flavonglycosides by High Performance Liquid Chromatography (HPLC)
LC133: Ginkgo Terpene Lactones by High Performance Liquid Chromatography (HPLC)

Results:

Sample #055529

Test	**Result**	**Units**
Lead	0.11	µg/g
Ginkgo Flavonglycosides test date 1/04/06		
Quercetin	16.9	% wt/wt
Kaempferol	4.72	% wt/wt
Isorhamnetin	1.14	% wt/wt
Total Flavonglycosides	22.8	% wt/wt
Ginkgo Flavonglycosides test date 1/12/06		
Quercetin	18.1	% wt/wt
Kaempferol	4.79	% wt/wt
Isorhamnetin	1.12	% wt/wt
Total Flavonglycosides	24.0	% wt/wt
Ginkgo Terpene Lactones		
Bilobalide	1.44	% wt/wt
Gmkgolide J	0.217	% wt/wt
Gmkgolide C	0.665	% wt/wt
Ginkgolide A	1.10	% wt/wt
Ginkgolide B	0.896	% wt/wt
Total Tergene Lactones	4.32	% wt/wt

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CERTIFICATE OF ANALYSIS
Job # 25354
Report Reprinted on January 24,2006

Sample Identification:
Sample #: 05-5530 Sample #18, Tablets, ACTA NSI Code GBS60014
Date Received: 12-15-05, Time Received: 03:00 PM

Method:
AL187: Metals by ICP MS
LC130: Ginkgo Flavonglycosides by High Performance Liquid Chromatography (HPLC)

Results:

Sample #05-5530

Test	**Result**	**Units**
Lead	0.11	µg/tablet
Ginkgo Flavonglycosides test date 1/04/06		
Quercetin	12.3	mgltablet
Kaempferol	2.73	mgltablet
Isorhamnetin	0.556	mgltablet
Total Flavonglycosides	15.6	mgltablet

Average weight = 757.24 mgltablet.

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CERTIFICATE OF ANALYSIS
Job # 25355

Sample Identification:
Sample #: 05-5531 Sample #19, Capsules, ACTA NSI Code GBN60023
Date Received: 12-15-05, Time Received: 03:00 PM

Method:
AL187: Metals by ICP MS
LC130: Ginkgo Flavonglycosides by High Performance Liquid Chromatography (HPLC)
LC133: Ginkgo Terpene Lactones by High Pel-formance Liquid Chromatography (HPLC)

Results:

Sample #05-5531

Test	Result	Units
Lead	0.04	µg/capsule
Ginkgo Flavonglycosides test date 1/04/06		
Quercetin	22.5	rnglcapsule
Kaempferol	4.79	mglcapsule
Isorhamnetin	1.42	rnglcapsule
Total Flavonglycosides	28.7	rnglcapsule
Ginkgo Terpene Lactones		
Bilobalide	2.47	mg/capsule
Ginkgolide J	0.318	mglcapsule
Ginkgolide C	1.09	rnglcapsule
Ginkgolide A	1.30	mg/capsule
Ginkgolide B	1.35	rnglcapsule
Total Terpene Lactones	6.53	mg/capsule

Average content weight = 304.27 rnglcapsule.

Dani Ignacio
Analyst II

Debra C. Orozco
Quality Manager

eurofins

1365 Redwood Way
Petaluma CA 94954
707.792.7300

January 26,2006

Mr. Cal Bewicke
Ethical Naturals, Inc
380 North Pastoria Avenue
Sunnyvale CA 94085

CERTIFICATE OF ANALYSIS
Job # 25355

Sample Identification:
Sample #: 05-5532 Sample #20, Tablets, ACTA NSI Code GBN60023
Date Received: 12-15-05, Time Received: 03:00 PM

Method:
AL187: Metals by ICP MS
LC130: Ginkgo Flavonglycosides by High Performance Liquid Chromatography (HPLC)

Results:

Sample #05-5532

Test	Result	Units
Lead	0.02	µg/tablet
Ginkgo Flavonglycosides test date 1/04/06		
Quercetin	6.19	mgltablet
Kaempferol	1.01	mgltablet
Isorhamnetin	0.323	mg/tablet
Total Flavonglycosides	7.52	mgltablet
Ginkgo Flavonglycosides test date 1/12/06		
Quercetin	6.02	rngltablet
Kaempferol	0.989	mgltablet
Isorhamnetin	0.305	mgltablet
Total Flavonglycosides	7.32	rngltablet

Average weight = 247.87 rngltablet.

Dani Ignacio
Analyst II

Debra C. Orozco
Quality Manager

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January 24, 2006

Mr. Cal Bewicke
Ethical Naturals, Inc
380 North Pastoria Avenue
Sunnyvale CA 94085

CERTIFICATE OF ANALYSIS
Job # 25356

Sample Identification:
Sample #: 05-5533 Sample #21, Powder, ACTA NSI Code GBS60024
Date Received: 12-15-05, Time Received: 03:00 PM

Method:
AL187: Metals by ICP MS
LC130: Ginkgo Flavonglycosides by High Performance Liquid Chromatography (HPLC)
LC133: Ginkgo Terpene Lactones by High Performance Liquid Chromatography (HPLC)

Results:

Sainple #05-5533

Test	Result	Units
Lead	<0.05	µg/g
Ginkgo Flavonglycosides test date 1/04/06		
Quercetin	3.52	% **wtlwt**
Kaempferol	3.68	% **wtlwt**
Isorhamnetin	0.690	% **wtlwt**
Total Flavonglycosides	7.90	% wt/wt
Ginkgo Flavonglycosides test date 1/12/06		
Quercetin	3.44	% **wtlwt**
Kaempferol	3.55	% **wtlwt**
Isorhamnetin	0.661	% **wtlwt**
Total Flavonglycosides	7.65	**%** wt/wt
Ginkgo Terpene Lactones		
Bilobalide	0.999	% wt/wt
Ginkgolide J	0.144	% **wtlwt**
Ginkgolide C	0.530	% wt/wt
Ginkgolide A	0.223	% wt/wt
Ginkgolide B	0.151	% wt/wt
Total Terpene Lactones	2.05	% wt/wt

Dani Ignacio
Analyst II

Debra C. Orozco
Quality Manager

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January 24,2006

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Ethical Naturals, Inc
380 North Pastoria Avenue
Sunnyvale CA 94085

CERTIFICATE OF ANALYSIS
Job # 25356

Sample Identification:
Sample #: 05-5534 Sample #22, Powder
Date Received: 12-15-05, Time Received: 03:00 PM

Method:
AL187: Metals by ICP MS
LC130: Ginkgo Flavonglycosides by High Performance Liquid Chromatography (HPLC)
LC133: Ginkgo Terpene Lactones by High Performance Liquid Chromatography (HPLC)

Results:

Sample #05-5534

Test	Result	Result (D)	Units
Lead	0.32	--	µg/g
Ginkgo Flavonglycosides test date 12/28/05			
Quercetin	12.8	12.9	% wt/wt
Kaempferol	9.42	9.36	% wt/wt
Isorhamnetin	2.24	2.23	% wt/wt
Total Flavonglycosides	24.5	24.5	% wt/wt
Ginkgo Terpene Lactones			
Bilobalide	**3.82**	3.72	% wt/wt
Ginkgolide J	0.267	0.303	% wt/wt
Ginkgolide C	0.921	0.969	% wt/wt
Ginkgolide A	2.61	2.62	% wt/wt
Ginkgolide B	1.62	1.54	% wt/wt
Total Terpene Lactones	9.24	9.15	% wt/wt

(D) = Duplicate sample preparation for internal quality control.

Dani Ignacio
Analyst II

Debra C. Orozco
Quality Manager

Table 1 Review of gingko samples for consistency of flavonol glycoside ratios

Sample #	Job #	Code	Q:K:I	Value Differentiation (Q:K)	Pass-Fail
1	25346	**GBDP0027**	3.6: 4.4: 1	0.81	Pass
2	25346	**GBDP0028**	**3.6:3.8:1**	0.94	**Pass**
3	25347	**GBE40017**	**6.1:6.1:1**	**1.00**	Pass
4	25347	**GBR40011**	**6.1:5.1:1**	1.19	Pass
5	25348	**GBN60022**	**2.8:2.4:1**	1.16	Pass
6	25348	**GBJ60019**	6.7: 4.9: 1	1.36	Pass
7	25349	**GBN60013**	6.3: 4.2: 1	1.50	Pass
8	25349	**GBT60025**	**8.1:5:1**	**1.62**	**Pass**
9	25350	**GBS40016**	7.7: 4.7: 1	1.63	Pass
10	25350	**GBR60015**	**9.6:5:1**	1.92	Pass
11	25351	**GBT60010**	**14.8:5.8:1**	2.96	Fail
12	25351	**GBN60021**	**18.8:7.0:1**	2.68	Fail
13	25352	**GBN60020**	10.6: 4.0: 1	2.65	Fail
14	25352	**GBJ60018**	**11.9:3.8:1**	3.13	Fail
15	25353	**GBW60026**	**13:3.7:1**	3.51	Fail
16	**25353**	**GBL60012**	**17.2:5:1**	3.44	Fail
17	25354	**GBAP0029**	15.4: 4.2: 1	3.66	Fail
18	25354	**GBS60014**	**22.1:4.9:1**	4.51	Fail
19	25355	**GBN60023**	**15.8:3.4:1**	4.64	Fail
20	25355	**GBN60023***	**19.5:3.2:1**	6.09	Fail

* Same code as sample 19

References

Upton R, Graff A. (eds.). 2003. *Ginkgo Leaf and Ginkgo Leaf Dry Extract.* Monograph of the American Herbal Pharmacopoeia. Scotts Valley, CA.

Table 1 Review of gingko samples for consistency of flavonol glycoside ratios

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2	25346	**GBDP0028**	**3.6:3.8:1**	0.94	Pass
3	25347	**GBE40017**	**6.1:6.1:1**	**1.00**	Pass
4	25347	**GBR40011**	**6.1:5.1:1**	1.19	Pass
5	25348	**GBN60022**	**2.8:2.4:1**	1.16	Pass
6	25348	**GBJ60019**	6.7: 4.9: 1	1.36	Pass
7	25349	**GBN60013**	6.3: 4.2: 1	1.50	Pass
8	25349	**GBT60025**	**8.1:5:1**	1.62	Pass
9	25350	**GBS40016**	7.7: 4.7: 1	1.63	Pass
10	25350	**GBR60015**	**9.6:5:1**	1.92	Pass
11	25351	**GBT60010**	**14.8:5.8:1**	2.96	Fail
12	25351	**GBN60021**	**18.8:7.0:1**	2.68	Fail
13	25352	**GBN60020**	**10.6:4.0:1**	2.65	Fail
14	25352	**GBJ60018**	**11.9:3.8:1**	3.13	Fail
15	25353	**GBW60026**	**13:3.7:1**	3.51	Fail
16	25353	**GBL60012**	**17.2:5:1**	3.44	Fail
17	25354	**GBAP0029**	**15.4:4.2:1**	3.66	Fail
18	25354	**GBS60014**	**22.1:4.9:1**	4.51	Fail
19	25355	**GBN60023**	**15.8:3.4:1**	4.64	Fail
20	25355	**GBN60023***	**19.5:3.2:1**	6.09	Fail

* Same code as sample 19

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Table 1 Review of gingko samples for consistency of flavonol glycoside ratios

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3	25347	GBE40017	6.1:6.1:1	1.00	Pass
4	25347	GBR40011	6.1:5.1:1	1.19	Pass
5	25348	GBN60022	2.8:2.4:1	1.16	Pass
6	25348	GBJ60019	6.7:4.9:1	1.36	Pass
7	25349	GBN60013	6.3:4.2:1	1.50	Pass
8	25349	GBT60025	8.1:5:1	1.62	Pass
9	25350	GBS40016	7.7:4.7:1	1.63	Pass
10	25350	GBR60015	9.6: 5:1	1.92	Pass
11	25351	GBT60010	14.8:5.8:1	2.96	Fail
12	25351	GBN60021	18.8:7.0:1	2.68	Fail
13	25352	GBN60020	10.6:4.0:1	2.65	Fail
14	25352	GBJ60018	11.9:3.8:1	3.13	Fail
15	25353	GBW60026	13:3.7:1	3.51	Fail
16	25353	GBL60012	17.2:5:1	3.44	Fail
17	25354	GBAP0029	15.4:4.2:1	3.66	Fail
18	25354	GBS60014	22.1: 4.9: 1	4.51	Fail
19	25355	GBN60023	15.8:3.4:1	4.64	Fail
20	25355	GBN60023*	19.5:3.2:1	6.09	Fail

* Same code as sample 19

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Table 1 Review of gingko samples for consistency of flavonol glycoside ratios

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2	25346	GBDP0028	3.6:3.8:1	0.94	Pass
3	25347	GBE40017	6.1:6.1:1	1.00	Pass
4	25347	GBR40011	6.1:5.1:1	1.19	Pass
5	25348	GBN60022	2.8:2.4:1	1.16	Pass
6	25348	GBJ60019	6.7:4.9:1	1.36	Pass
7	25349	GBN60013	6.3:4.2:1	1.50	Pass
8	25349	GBT60025	8.1:5:1	1.62	Pass
9	25350	GBS40016	7.7:4.7:1	1.63	Pass
10	25350	GBR60015	9.6:5:1	1.92	Pass
11	**25351**	**GBT60010**	**14.8:5.8:1**	**2.96**	**Fail**
12	**25351**	**GBN60021**	**18.8:7.0:1**	**2.68**	**Fail**
13	**25352.**	**GBN60020**	**10.6:4.0:1**	**2.65**	**Fail**
14	**25352**	**GBJ60018**	**11.9:3.8:1**	**3.13**	**Fail.**
15	**25353.**	**GBW60026**	**13:3.7:1**	**3.51**	**Fail**
16	**25353**	**GBL60012**	**17.2:5:1**	**3.44**	**Fail**
17	**25354**	**GBAP0029**	**15.4:4.2:1**	**3.66**	**Fail**
18	**25354**	**GBS60014**	**22.1:4.9:1**	**4.51**	**Fail**
19	**25355**	**GBN60023**	**15.8:3.4:1**	**4.64**	**Fail**
20	**25355**	**GBN60023***	**19.5:3.2:1**	**6.09**	**Fail**

* Same code as sample 19

References

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Table 1 Review of gingko samples for consistency of flavonol glycoside ratios

Sample #	Job #	Code	Q:K:I	Value Differentiation (Q:K)	Pass-Fail
1	25346	GBDP0027	3.6:4.4:1	0.81	Pass
2	25346	GBDP0028	3.6:3.8:1	0.94	Pass
3	25347	GBE40017	6.1:6.1:1	1.00	Pass
4	25347	GBR40011	6.1:5.1:1	1.19	Pass
5	25348	GBN60022	2.8:2.4:1	1.16	Pass
6	25348	GBJ60019	6.7:4.9:1	1.36	Pass
7	25349	GBN60013	6.3:4.2:1	1.50	Pass
8	25349	GBT60025	8.1:5:1	1.62	Pass
9	25350	GBS40016	7.7:4.7:1	1.63	Pass
10	25350	GBR60015	9.6:5:1	1.92	Pass
11	25351	**GBT60010**	**14.8:5.8:1**	2.96	Fail
12	25351	**GBN60021**	**18.8:7.0:1**	2.68	Fail
13	25352	**GBN60020**	**10.6:4.0:1**	**2.65**	Fail
14	25352	**GBJ60018**	**11.9:3.8:1**	3.13	Fail
15	25353	**GBW60026**	**13:3.7:1**	**3.51**	Fail
16	25353	**GBL60012**	**17.2:5:1**	3.44	Fail
17	25354	**GBAP0029**	**15.4:4.2:1**	3.66	Fail
18	25354,	**GBS60014**	**22.1:4.9:1**	4.51	**Fail**
19	25355	**GBN60023**	**15.8:3.4:1**	4.64	Fail
20	25355	**GBN60023***	**19.5:3.2:1**	6.09	Fail

* Same code as sample 19

References

Upton R, Graff A. (eds.). 2003. *Ginkgo Leaf and Ginkgo Leaf Dry Extract.* Monograph of the American Herbal Pharmacopoeia. Scotts Valley, CA.

Table 1 Review of gingko samples for consistency of **flavonol** glycoside ratios

Sample #	**Job #**	Code	**Q:K:I**	Value **Differentiation (Q:K)**	Pass-Fail
1	25346	**GBDP0027**	3.6: 4.4: 1	0.81	Pass
2	**25346**	**GBDP0028**	**3.6:3.8:1**	**0.94**	Pass
3	25347	**GBE40017**	**6.1:6.1:1**	1.00	Pass
4	25347	**GBR40011**	**6.1:5.1:1**	1.19	Pass
5	25348	**GBN60022**	**2.8:2.4:1**	1.16	Pass
6	25348	**GBJ60019**	**6.7:4.9:1**	1.36	Pass
7	25349	**GBN60013**	**6.3:4.2:1**	1.50	Pass
8	**25349**	**GBT60025**	**8.1:5:1**	1.62	**Pass**
9	**25350**	**GBS40016**	**7.7:4.7:1**	1.63	Pass
10	25350	**GBR60015**	**9.6:5:1**	1.92	**Pass**
11	**25351**	**GBT60010**	**14.8:5.8:1**	**2.96**	**Fail**
12	25351	**GBN60021**	18.8: 7.0: 1	2.68	Fail
13	25352	**GBN60020**	**10.6:4.0:1**	**2.65**	Fail
14	**25352**	**GBJ60018**	**11.9:3.8:1**	**3.13**	**Fail**
15	**25353**	**GBW60026**	**13:3.7:1**	**3.51**	**Fail**
16	25353	**GBL60012**	**17.2:5:1**	3.44	Fail
17	25354	**GBAP0029**	**15.4:4.2:1**	3.66	Fail
18	25354	**GBS60014**	**22.1:4.9:1**	4.51	Fail
19	25355	**GBN60023**	**15.8:3.4:1**	4.64	Fail
20	**25355**	**GBN60023***	**19.5:3.2:1**	6.09	Fail

* Same code as sample 19

References

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Table 1 Review of gingko samples for consistency of flavonol glycoside ratios

Sample #	Job#	Code	Q:K:I	Value Differentiation (Q:K)	Pass-Fail
1	25346	GBDP0027	3.6:4.4:1	0.81	Pass
2	25346	GBDP0028	3.6:3.8:1	0.94	Pass
3	25347	GBE40017	6.1:6.1:1	1.00	Pass
4	25347	GBR40011	6.1:5.1:1	1.19	Pass
5	25348	GBN60022	2.8:2.4:1	1.16	Pass
6	25348	GBJ60019	6.7: 4.9: 1	1.36	Pass
7	25349	GBN60013	6.3: 4.2: 1	1.50	Pass
8	25349	GBT60025	8.1:5:1	1.62	Pass
9	25350	GBS40016	7.7: 4.7: 1	1.63	Pass
10	25350	GBR60015	9.6: 5:1	1.92	Pass
11	25351	GBT60010	14.8:5.8:1	2.96	Fail
12	25351	GBN60021	18.8:7.0:1	2.68	Fail
13	25352	GBN60020	10.6:4.0:1	2.65	Fail
14	25352	GBJ60018	11.9:3.8:1	3.13	Fail
15	25353	GBW60026	13:3.7:1	3.51	Fail
16	25353	GBL60012	17.2:5:1	3.44	Fail
17	25354	GBAP0029	15.4:4.2:1	3.66	Fail
18	25354	GBS60014	22.1:4.9:1	4.51	Fail
19	25355	GBN60023	15.8:3.4:1	4.64	Fail
20	25355	GBN60023*	19.5:3.2:1	6.09	Fail

* Same code as sample 19

References

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