Lost in Jonathan Ott's Footsteps:

Acetone Tinctures of *Salvia divinorum*

by Zhah

This isn't the article I was hoping to write. I was hoping to report on an easy-to-make, easy-to-dose, and highly effective *Salvia divinorum* tincture. But the looming end of *The Entheogen Review* has prompted me to relate the curious null-results of my attempts as they stand.

The most common *Salvia divinorum* tinctures are ethanol-based. This, despite the poor solubility of salvinorin A in ethanol—1.28 mg/ml in 200 proof ethanol rapidly becoming less soluble with declining proof (Sphere 2006A)—the extreme irritation to mucus membranes by high-proof ethanol, and the perhaps unwanted additional buzz that can accompany an ethanol tincture for those sensitive to the effects of alcohol.

My thought on this was: Why bother with the ethanol at all, if it's problematic? I recalled that acetone has a low toxicity, and it seemed to me that one could simply extract with acetone and evaporate down to saturation, to quickly and easily make an acetone tincture. With a solubility of 23 mg/ml for salvinorin A in acetone (Sphere 2006A), only ~50 microliters (µl) of acetone tincture would be needed to deliver a 1 mg dose as compared to approximately 1 ml for an ethanol tincture. Measuring this small amount of liquid reliably may seem problematic, but in the age of e-Bay, used volumetric micropipettes, which retail for several hundred dollars, are available for $20–70.[1] Since micropipettes are highly accurate, even down to the order of < 1 µl, micropipetting acetone tinctures should be an easy and economical way to accurately measure extremely small amounts of salvinorin A without having to invest a thousand dollars or more in an analytical balance. This led me to my second idea: anybody wanting to work directly with vaporizing or smoking salvinorin A could micropipette the appropriate amount of acetone tincture directly into the elbow of a slightly bent glass tube or onto a square of blotter, let the acetone evaporate, and then micro-torch the elbow while inhaling through the tube or simply smoke the blotter.

Scroogle.org revealed to me that I was not the first to consider acetone tinctures of *Salvia divinorum*. Jonathan Ott (1995A) conjectured that excessive salivation due to the irritation of mucus membranes by ethanol may reduce absorption or even cause the salvinorin A to precipitate out while in the mouth when using alcohol-based tinctures, hence decreasing their efficacy. Ott expected rapid absorption with much less irritation and salivation, and hence better efficacy, from an acetone-based tincture. Ott bioassayed a 10 mg/1.0 ml solution of salvinorin A in acetone and found it to be even more potent than vaporized salvinorin A, obtaining threshold activity at 100 µg, definite psychoactivity at 250–500 µg, and visionary activity above 1 mg; he also reported similar success from using a 10 mg/1.0 ml solution in DMSO[2] (Ott 1995B). This sounded promising!

People are reluctant to consume acetone, although with an oral LD50 of 5800 mg/kg in rats (Oxford University 2008A), this chemical has relatively low toxicity. Acetone is a natural metabolic by-product in the human body and is present in blood and virtually every organ and tissue, as well as in other plants, animals, and insects (CCOHS 2008A). The Canadian Centre for Occupational Health & Safety reports no or only minor effects in people ingesting up to 20 grams per day (!) for several days (CCOHS 2008B). With an oral LD50 of 7060 mg/kg in rats (Oxford University 2008B), ethanol is not much less toxic than acetone, but this particular mind-numbing poison enjoys the grace of

social acceptance, so few people really think twice about drinking it. Like ethanol, acetone is highly irritating to mucus membranes; but, as mentioned above, due to the much greater solubility of salvinorin A in acetone, approximately 18 times less solvent is required to deliver a dose in acetone than in ethanol, and correspondingly less irritation of mucus membranes is expected. Acetone can, however, be a life-threatening aspiration hazard, so great care must be taken not to breathe the liquid into the lungs, whatever one is attempting (CCOHS 2008b).

Procedure

I based my approach on Sphere's *Salvia divinorum Extractions Using Chilled Acetone* tek (Sphere 2006b), which extracts three times for 3 minutes each with -10° C acetone, the idea being that the chilled acetone leaves more of the gunk behind while still getting the salvinorin A, due to its high solubility even in subzero acetone. The extracts are combined and filtered to remove sediments, evaporated, and the resulting residue is washed several times with naphtha to remove remaining chlorophyll and plant lipids. The result is a greenish-white crystalline powder. Sphere also suggests optional water washes to remove tannins, and several isopropyl alcohol (IPA) washes to get rid of the remaining chlorophyll. Sphere reports that you can wash all the way to white with IPA, losing more and more of your yield with each wash due to solubility of salvinorin A in IPA.

Extraction #1: 10.1 grams of dried whole *Salvia divinorum* leaf (sourced from a reliable Mexican vendor) were powdered and extracted three times with 50 ml of -8° C acetone in a pre-chilled vessel nested in an ice and salt water slurry, maintaining a temperature of < -5° C during the extraction. The extracts were combined and evaporated. (This evaporation was unplanned. Due to time constraints, the combined extract was simply left standing instead of being filtered first, and the solvent evaporated on its own.) The residue was redissolved in 20 ml of 20° C acetone, filtered through a coffee filter to remove sediment, and again evaporated. True to my initial idea of simply "extracting with acetone and reducing," I skipped all the washes. The emerald-green residue was scraped up and dissolved in 2 ml of pharmaceutical grade acetone.

Bioassay #1: Assuming approximately 2–3 mg/g leaf based on average leaf potency (Gruber et al. 1999) and a maximal yield, I calculated that a 50 µl dose would contain approximately 500–750 µg salvinorin A, while a 20% yield would correspond to 100–150 µg, Ott's reported threshold dose. 50 µl were applied sublingually and held in the mouth for 25 minutes. The solution burned slightly and was unpleasant. No activity was noted.

Bioassay #2: 100 µl, assumed to correspond to a dose of 200 µg–1.5 mg, was similarly bioassayed. Again no activity was noted.

After these disappointments, I decided that a more quantitative approach was required to provide proof-of-concept. The remaining 1.85 ml were evaporated, washed four times with 2–3 ml naphtha and evaporated, producing 34 mg of light green powder. Sphere reports yields of 2 mg/g and higher (Sphere 2006b).[3] Based on this, and in order to set an approximate lower limit for the dosing, I assumed a yield of at least 1 mg/g, which would mean that the extract should contain at least 10 mg of salvinorin A. This was dissolved in 0.5 ml of pharmaceutical grade acetone, which should have produced an almost saturated solution.

Bioassay #3 & #4: Teeth, gums, tongue, and mucus membranes below tongue were brushed thoroughly and rinsed with the menthol-containing mouthwash "One Drop Only" for 15 minutes. Then 25 µl of tincture were applied sublingually and held below my tongue for 20 minutes with the tongue slightly elevated to reduce salivation. This should have corresponded to a dose of at least 500 µg. Only very mild threshold effects were perceived, which easily might have been placebo effects due to set and expectations. An additional 50 µl assumed to correspond to 1 mg salvinorin A was applied sublingually and held under tongue for 30 minutes. A deep meditative state was reached, which may indicate psychoactivity, but it was sub-psychedelic and not reminiscent of *Salvia* space. Are there immediate tolerance effects for salvinorin A?

Extraction #2: At this point the problems arising from not knowing the purity of my extract became painfully obvious. At any rate, my initial hopes of a quick and easy tincture were dashed. The lack of definite psychoactivity puzzled me, however, and I decided to proceed with the proof-of-concept experiments. I again extracted 10 grams of dried, crushed *Salvia divinorum* leaves three times in chilled acetone, washed two times in water, numerous times in naphtha (until it stopped taking on color), and four times in IPA. The result was approximately 20 mg of crystalline white powder with only a slight green tinge, which I assumed to be relatively pure salvinorin A. This was dissolved in 2 ml of pharmaceutical grade acetone.

Bioassays #6–10: A series of bioassays was performed with 10, 20, 50, 100, and 200 µl of acetone tincture, assumed to correspond to doses of approximately 100 µg, 200 µg, 500 µg, 1 mg, and 2 mg respectively, applied sublingually as above. At no time were perceived psychoactive effects greater than sub-psychedelic, which might also just have been placebo effects of set and expectations. *Salvia* space, familiar to me from the quid method using fresh leaves, was never perceived.

Bioassays #11–13: 50, 100, and 200 µl were micropipetted into the middle of a glass tube and allowed to evaporate. The glass tube was heated with a micro-torch while I inhaled through it. No effect other than burnt fingers was perceived.

Discussion

These results were very disappointing, especially in light of Ott's description of the remarkable efficacy of acetone tinctures. I contacted Daniel Siebert. He reported having had previous personal success with acetone tinctures, but with a much lower efficacy than Ott reported, obtaining only mild effects from a 1 mg dose (Siebert 2007). In addition, David Aardvark reported to me having no effects at all from sublingual application of 2 mg dissolved in acetone (Aardvark 2008).

Siebert asked if I'd had any previous success with quids, ethanol tinctures, or smoked leaf. Having a problem with smoke in my lungs and also having an extremely low tolerance for and dislike of ethanol, I had never smoked *Salvia divinorum* [*but see Epilogue*] nor used an ethanol tincture; however, I have always entered *Salvia* space easily using the quid method with fresh leaves. I did experience excessive salivation during the bioassays, even from just 50 µl of acetone, so maybe Ott's conjecture regarding a drop in solubility and the resulting precipitation in ethanol tinctures also applies to acetone tinctures.

Bioassays #11–13 make me seriously question the purity of my extract, and without access to GC/MS, I had no way of knowing how much salvinorin A was actually in my tinctures. However, each step of the extraction corresponded visually very well to the images and descriptions posted on-line (Sphere 2002–2006; Sphere 2006b).

I had based my extractions on Sphere's *Salvia divinorum Extractions Using Chilled Acetone* tek to reduce the amount of "contaminants," so that I could try to work with roughly estimable doses of fairly pure salvinorin A. However, Siebert and Sphere have both noted that some leaf components appear to actually facilitate sublingual absorption (Siebert 2008; Sphere n.d.). Yet bioassays #1 and #2 should have covered this possibility, if the acetone tincture had been as effective for me as for Mr. Ott.

Epilogue

After submitting a draft of this article to *The Entheogen Review*, David Aardvark and I puzzled over possible causes of my null results. We concluded that there were three possibilities: the leaf was inactive (it hadn't otherwise been bioassayed); the extraction process went awry; or the acetone tincture wasn't working for me, at least not in whatever doses I had taken it. This meant that to clinch this experiment we must: assay the leaf, analyze the extract, and repeat the bioassays with known doses of a verified sample of salvinorin A.

Bioassaying the leaf was easy. Despite my aversion to smoking, I purchased a $10 bong at the local head shop, crumbled a single dried leaf of approximate 0.25 g mass into the bowl, micro-torched it,

inhaled, and blasted off. I was launched into a Shulgin "plus four"/*Salvia* Level 5 state of colorful mystical union with The Ultimate Reality. The shocking abruptness of this experience reminded me of Alan Watts' comment regarding his DMT experience as "being struck by noetic lightning." I concluded that the leaf was active.

Analyzing the extract posed greater difficulties. At the conclusion of my experiments last year, I had dumped the remaining 0.1–0.2 ml of tincture onto a watch glass, put it in the chemicals cabinet and forgot about it, as I routinely "dispose" of solvents by simply letting them evaporate, and because my own attempts to arrange an analysis hadn't panned out. When David told me six months later that he could arrange for a reference standard and a lab analysis, and asked me if I had any extract left to analyze, I cringed inwardly. I checked the cabinet and found the residue of the tincture on the watch glass, which consisted of a tiny speck of white crystal in the middle surrounded by green residue, greener than I remembered it being in my cleaned extract. I thought hard: had I dumped the tincture onto a *clean* watch glass? Was this the remnant of the extract? While I couldn't be sure that the glass had been clean, I was fairly certain that those last ~0.2 ml had landed on that watch glass, so I decided to "give it a whirl." I scraped up all the residue (approximately 5 mg total) and mailed it off, along with the comment that I wouldn't want to bet my life on this one.

Disappointingly, the lab didn't find any salvinorin A detectable in the sample that was sent; they only found traces of three other unidentifiable compounds.[4] (Interestingly, the major unidentifiable compound of the three was also present in the 98+% pure reference standard; it may be one of the other salvinorins found in the plant.) This meant that I could no longer definitely conclude that the acetone tinctures weren't working for me. But because of the uncertain condition and quality of the sample being analyzed, I also couldn't conclude for certain that the extraction had gone awry either. That question remains open. Nevertheless, the lab results *did* mean that our third task of repeating the bioassays with known material was that much more important.

I contacted Daniel Siebert and ordered 20 mg of 98+% pure salvinorin A, which Daniel kindly provided at a discount and shipped immediately, due to the deadline for this article. The material was dissolved in 1.0 ml of pharmaceutical grade acetone and a new series of bioassays was performed.

Bioassay #14: 50 µl of acetone tincture, corresponding to 1 mg of salvinorin A, were applied sublingually and held under the tongue with my tongue slightly elevated for 5 minutes. At that point I spread the accumulated saliva around my cheeks and gums with my tongue and waited another 10 minutes. No effects were noted.

Bioassay #15: 100 µl of tincture, corresponding to 2 mg of salvinorin A, were applied as above. While I thought a slight shift within the first minute of application might be the start of psychoactivity, no further effects were noted.

Bioassay #16–17: 200 µl of tincture, corresponding to 4 mg of salvinorin A, were applied as above. After 10 minutes and no effects an additional 400 µl were applied, again with no notable psychoactivity after 20 minutes. However, making a curious tale curiouser and curiouser, I felt quite certain that I *did* obtain low-level psychoactivity *two hours later* over a period of two hours while I lay awake, futilely trying to sleep. The combined 0.6 ml of acetone damaged my sublingual tissues to the extent that the top layer of tissue fell off and left the area under my tongue sore for several days. I wouldn't want to assay this amount of acetone tincture again.

Bioassay #18: 50 µl of tincture, corresponding to 1 mg of 98+% pure salvinorin A, were micropipetted into a glass tube identical to the one I had used previously, but new and clean. I micro-torched the glass tube while inhaling through it. No effects. I weighed the tube on a milligram scale before and after heating and there was no change in weight.

Bioassay #19: 50 µl of tincture, corresponding to 1 mg of 98+% pure salvinorin A, were pipetted onto a piece of aluminum foil and allowed to evaporate. The foil was micro-torched from beneath while I

inhaled the vapors through the tube. Blast off. Same experience as with the dried leaf. I concluded from this that I hadn't been able to heat the residue sufficiently to vaporize it in the glass tube. This means that bioassays #11–13 wouldn't have worked regardless of whether my extract was active or not. Unfortunately, it didn't originally occur to me to bioassay my extract using aluminum foil.

Bioassays #16 and #17, in particular, are of special interest. This combined dose of 12 mg salvinorin A was completely ineffective for me within the normal time frame and showed unexpected low-level activity much later. I have gotten good results within 20 minutes using the quid method with 10–50 g of fresh leaf, which would contain roughly 3–16 mg of salvinorin A, assuming that 10 g fresh are roughly equivalent to 1.3 g dried. This dose is around the order of the 12 mg of salvinorin A assayed in the acetone tincture. When doing 50 g amounts of fresh leaf, I have split the material into two 25 g quids and replaced the first quid at 10 minutes, similar to the procedure for bioassays #16 and #17 above. When using quids, I have excessive salivation, but get results nevertheless, so the salivation I experienced with the acetone tinctures isn't necessarily the problem. I did, however, experience substantial irritation of the mucus membranes with acetone tincture that I don't with quids. Perhaps this prevented absorption? Also, fresh-leaf quids contain all the other substances in the leaves, which, as mentioned, seem to aid absorption. Regardless, it is now quite certain that the acetone tinctures are basically ineffective for me, even at very high doses.

Incidentally, all of the new developments reported on in this Epilogue occurred during the one week before this article went to press.

I conclude this strange tale by relating the first "normal" thought I had back on planet Earth after smoking the dried leaf (pardon the vulgarities, but they accurately capture what I thought): "Fuck the acetone tinctures… just get a bong and smoke the shit." Which is a wisdom, it seems, that everyone else figured out long ago.

Acknowledgments

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Footnotes

1. You never know what was previously drawn into a used micropipette (e.g. blood for AIDS tests), so when acquiring one inquire as to how it has been used; and whatever the case, *autoclave* the disassembled pipette in the steam insert of a pressure cooker before use! This won't damage the micropipette, they are made to be autoclaved. Be sure to also acquire and use the disposable tips.

2. Difficulties in replicating Ott's results are not restricted to acetone tinctures. Just before this article went to print, I was forwarded the following bioassay report from a researcher who wished to remain anonymous:

> Your article seems consistent with anecdotal experiences using DMSO. Up to 8 mg pure salvinorin A (in 2 ml of a 25% DMSO solution), held in the mouth for a bit over ten minutes, was modestly psychoactive (felt physically off-balance, pressure on chest, somewhat stoned feeling), but certainly not psychedelic like smoking *Salvia divinorum*.

3. Sphere's "2 mg/g or higher" figure was inferred based on a statement in *Salvia Divinorum Salvinorin Extraction and Refinement FAQ* relating that from 250 grams of crushed leaf you get 1 g of extract which is "at least 50%" salvinorin A. Although Sphere washed his material until it was white, there is no report of any quantitative (or qualitative) analysis having been done on it. Sphere's presumption appears to be that the totally white crystals are nearly pure salvinorin A.

4. This might be interesting in itself, because it would mean that the extraction procedure hadn't worked for me, and I generally have good laboratory technique. The question, therefore, would also remain as to what, in fact, *had* been extracted.